ANNUAL REPORT FOR 1934

Northern Rocky Mountain Forest and Range Experiment Station
Missoula, Montana

FILE
COPY

R
Investigative Program
Northern Rocky Mountain Region

July 13, 1935

ANNUAL REPORT FOR 1934

and

PROGRAM FOR FISCAL YEAR 1936

LYLE F. WATTS

LYLE F. WATTS, Director

2 copies to Washington
1 copy to Priest River
1 extra copy for use in 1936
1 set of Status sheets only sent to Miles City
1 set of Status sheets only sent to Reception Cr. — mimeographed copy sent to complete.
x 1 file copy

C O N T E N T S

	Page
Introduction	1
Investigative Council	3
Matters of General Interest	3
Civilian Conservation Corps	4
National Industrial Recovery Act	5
Federal Emergency Relief Administration . . .	6
Selection of Research Areas	7
Tepee Creek Natural Area	7
Rochester Basin Experimental Range	7
Vigilante Experimental Range	8
Clearwater Experimental Forest	8
Pleasant Valley Experimental Forest	10
Progress and Plans by Lines of Work	11
Forest Management	11
Silviculture	11
White Pine Reproduction Study	11
White Pine Methods of Cutting	13
Ponderosa Pine Methods of Cutting . . .	14
White Pine Growth and Yield	14
Ponderosa Pine Growth and Yield	15
Larch-fir Growth and Yield.	15
White Pine Thinning Methods	16
Ponderosa Pine Thinning Methods	16

Page

Botanical Studies 17

Reforestation 17

Fire Research 18

Range Research 21

Forest Products 25

Forest Survey 31

Experiment Station Personnel 40

Expenditures F.Y. 1935 44

Research Project Allotment Sheet F.Y. 1936 (Form 1) 45

Research Allotment Sheet (Form 2). 46

Estimated Distribution of Overhead (Form 3). . . 47

Publications 48

Published Since Last Report 48

Submitted for Publication 50

In Preparation or Proposed F.Y. 1936 51

Status Sheets 54

INTRODUCTION

The major shift in national thinking of the last few years from a "laissez faire" attitude to one of coordinated planning has greatly increased the work and responsibilities of this Station. The administration of Article X of the Lumber Code called for every bit of available information usable in working out and revising woods practice rules. Although the NRA has now been discontinued the impetus given to selective logging based on sound economic principles should continue and should have the effect of leaving our future private cutover lands in better condition to produce another crop.

The many organizations concerned with land use planning have placed demands on the Station for all the help we can give. Data, type maps in particular, from the Forest Survey are constantly sought after. It is unfortunate that more of the area has not been completed in order that the possibilities of future management could be adequately stressed. The data on artificial reseeding of abandoned dry farms are constantly in demand for use in eastern Montana and our results in managing range land in accordance with proper stocking are finally getting across. It is particularly satisfying to have the various Federal financing agencies request and use these data in connection with land and livestock loans and land valuations.

The impetus given to forestry by increased programs for blister rust control, stand improvement, and planting similarly require most of the data available from our silvicultural research. Unfortunately, work in this field has of necessity been confined to the white pine type and therefore the service which we can give in this field is greatly curtailed.

Fire research results are placed in use currently. The fire danger measurement technique and procedure which has been worked out by the Station is now used as the basis for current fire control organization changes and for placing restrictions on the use of the forests during the fire season while the fire control planning project has been absorbed completely by the region in building up to the new objective of corralling all fires in the first work period.

The floods in northern Idaho and the dust storms of eastern Montana have both emphasized the need and brought to us demands for information on the effect of vegetative cover on streamflow and erosion.

Altogether, the requests for usable data at last exceed our supply and we are often embarrassed by the lack of information which results from having had too meager financial support in the past and of still having too limited allotments to attack even the most pressing problems.

INVESTIGATIVE COUNCIL

The annual formal meeting of the Regional Investigative Council was dispensed with this year and in its place small group conferences to consider specific projects were substituted. The continued uncertainty of funds for carrying out the rather elaborate plans for emergency expansion occasioned one delay after another in scheduling a meeting date until the field season was on and the interested personnel were to a large extent in the field. Inasmuch as the primary purpose of such a meeting is that of considering plans for the season it is just as well that a meeting was not held. The exhaustion of NIRA funds and the uncertain status of ECW research funds, together with the failure to allocate a sufficient amount of usable ERA money all tend to nullify the conferences held and the plans prepared for the year's program of work.

MATTERS OF GENERAL INTEREST

The past year, as in 1933, proved to be one of further reductions in regular appropriations but of increased total expenditures due to fairly liberal allotments of emergency funds. In contrast to 1933, however, we were fully prepared for this temporary expansion and had a sufficient nucleus of trained temporary men to amply supervise

the various projects.

CIVILIAN CONSERVATION CORPS

The Station was particularly fortunate during 1934 in the allocation of Civilian Conservation camps. One entire camp was allocated each to Priest River Experimental Forest, Deception Creek Experimental Forest, and Coram Experimental Forest. While the largest single work project in each instance was the construction of utilization and protection roads, material progress was made in many other ways. The enrollees, under the direction of carefully selected technicians, established thinning and stand improvement plots, treated a considerable area of old burns to reduce the fire hazard, eradicated the ribes from the entire area of the two white pine experimental forests, poisoned rodents, accomplished a number of improvements on the station grounds, fireproofed and cleaned up many miles of roadside, planted trees on poorly stocked areas and in the arboretum, and assisted in many other improvement and research projects. From 4 to 8 selected enrollees were assigned during the entire year for office work at the Station headquarters at Missoula.

Present plans call for a full camp at Priest River not only for the present summer but for the winter of 1935-36 as well, a full camp at Deception during the summer, and approximately half a camp at Coram for the winter

of 1935-36. With this amount of CCC help assured the road and trail systems on these experimental forests will be completed in a reasonable period and a vast amount of other worthwhile work will be done. Unfortunately, the camp allotments for overhead, equipment and materials, and miscellaneous expenses have now been so greatly reduced that much otherwise logical work, including station buildings, cannot be attempted. CCC assistance at Miles City has been impossible to obtain due to the long distance from any established camp.

NATIONAL INDUSTRIAL RECOVERY ACT

Funds allotted to the Station under the National Industrial Recovery Act made possible a vast amount of work, not only in the way of improvements but on research projects as well.

The major improvement items were a 150-foot fire-weather observation tower, a 4-room cottage, and the completion of 13½ miles of power line from the town of Priest River to the Experimental Forest at Priest River; one 5-room and one 3-room dwelling, a shop, a 5-stall garage, a gas house, water system, and landscaping at Deception; and a 2-stall garage and a 5-room dwelling at old Fort Keogh.

Additional projects not covered elsewhere under the research progress section of this report were an

intensive timber survey of the Priest River, Deception and Coram Experimental Forests, and the preparation of exhaustive reports in each instance; and an intensive grazing-erosion survey of the Rochester Basin area of 101,266 acres of spring-fall foothill range under consideration for an experimental range. Due to the fact that this area contains a large amount (approximately 60%) of public domain its formal dedication to research must await a decision as to a division of responsibility between departments.

FEDERAL EMERGENCY RELIEF ADMINISTRATION

The only Federal Emergency Relief project undertaken by this Station was an erosion control project at old Fort Keogh. Approximately $3500 of FERA money was used in the construction of two rock jetties in the Yellowstone River adjacent to our experimental field of reseeding plots. The object of the project was to control river bank cutting by the use of jetties and by the planting of willows and various grasses on the river bank immediately below the jetties. These high river banks were reduced from perpendicular to moderate slopes. Half of the slope banks were seeded to grass in the fall of 1934 and the other half in the spring of 1935. Willow cuttings were planted along the water edge at the lower end of the slope banks. While the results from this work will not be known for several years, it is hoped that the reduction in acreage used for intensive

intensive artificial reseeding studies can be halted.

SELECTION OF RESEARCH AREAS

Material progress in rounding out the system of experimental forests and ranges and natural areas was made during the past year.

TEPEE CREEK NATURAL AREA

In the white pine type on the Kaniksu National Forest a beautiful area of 746 acres, largely an overmature climax forest, was selected as a natural area. The formal report is awaiting approval by the Washington Office. This area should by all means be retained permanently in its virgin condition as it is one of the few remaining really suitable areas of virgin old growth white pine adjacent to Priest Lake and in fact on the Kaniksu National Forest.

ROCHESTER BASIN EXPERIMENTAL RANGE (Proposed)

The foothill spring-fall range area previously mentioned was selected for an Experimental Range and covered by an intensive grazing-erosion survey. This area is typical of the spring-fall ranges of Montana and is ideally suited for experimental work, not only for this reason but also because of its accessibility both to the railroad and to main traveled highways. The formal establishment report has been prepared and submitted to Washington but approval must await a final decision as to the ultimate division of responsibility for this type of Public Domain watershed land.

VIGILANTE EXPERIMENTAL RANGE (Proposed)

There are three major range conditions which must be studied and the use of which must be correlated before a sound, balanced range use program for Montana can be developed. These are the short grass ranges of the Northern Great Plains, the foothill spring-fall ranges of central Montana and the high mountain summer ranges on the National Forests. The first condition is covered by the existing Station near Miles City, the second by the Rochester Basin area discussed above, and the third by the Vigilante area selected on the Beaverhead National Forest. This area located on the Ruby River District of the Beaverhead National Forest consists of about 7500 acres of typical summer range, or sufficient to carry 125 head of cattle and 1500 head of sheep for the usual summer grazing season. Agreement between the Forest, the Region, and the Experiment Station on location and boundaries has been reached and the formal establishment report will be submitted to Washington for consideration and final approval within the next few days.

CLEARWATER EXPERIMENTAL FOREST (Proposed)

An area in the south end of the white pine range is badly needed as a center of work for this most productive subregion and for the prevailing 100-130 year age class there represented. During the past year some 12 areas have been examined but no suitable tract could be found on National Forest land. An area of 8 sections owned by one

of the large timber companies was examined and found to be ideal in every way and could be purchased at a reasonable price for the commercial stumpage involved. A formal report recommending its acquisition as an Experimental Forest has been prepared and will be submitted if and when the allotment of funds for acquisition are large enough to make possible a sizeable allocation for this purpose.

Another nearby area owned by the State of Idaho was located, examined and found to be fairly suited to our needs. The State officials responsible for State lands in Idaho favor the dedication of this timber tract for research use by the Northern Rocky Mountain Station but the restrictions, legal and otherwise, which would have to be written into the agreement make the selection of the area advisable only as a last resort. It is not probable that either area can be acquired through exchange due to the fact that no legislation has been enacted authorizing in Idaho the exchange of National Forest land or stumpage for land now outside the National Forest boundry, because timber sale receipts in Idaho are obligated up to the allowable exchange percentage for years ahead, and because the National Forests have no white pine stumpage equally as desirable to hold as these two tracts.

A desirable area of overmature climax white pine on National Forest land, suitable for a natural area, has been located only a few miles from either of the above two white

pine tracts. Formal recommendation for its dedication as a natural area is being withheld because it is desired to have the Experimental Forest and Natural Area for this subregion as close together as possible.

PLEASANT VALLEY EXPERIMENTAL FOREST (Proposed)

The one other urgently needed research center is an Experimental Forest in the ponderosa pine type. Approximately two weeks was devoted to an examination of a large number of areas suggested as possibly suitable for this purpose. Unfortunately, the bulk of the good accessible ponderosa pine timber passed to private ownership prior to the creation of the National Forests and therefore no area at all suitable in public ownership was located. Two desirable areas belonging to the ACM Lumber Company both outside the national forests, were examined and the manager of the company was contacted regarding possible exchange or purchase. One area is now under contract to log and was not for sale. The other, Paradise Valley, may be acquired if agreement as to values can be arrived at. There is little probability that an exchange can be consummated because of the small volume of timber sales in Montana. A formal report recommending the selection of this tract as a purchase area by the National Forestry Reservation Commission has been prepared and is being held pending the allocation of a sizeable fund for acquisition of virgin timber in the West.

PROGRESS AND PLANS BY LINES OF WORK

FOREST MANAGEMENT

SILVICULTURE

White Pine Reproduction Study

This group of studies, now in their tenth year, has answered many of the pressing questions relative to white pine establishment and survival. Three phases of the problem have been studied. (1) An intensive investigation of the cause of seedling mortality during the first two years. (2) The rate of seedling establishment on areas cut over under various silvicultural methods and on various sites and exposures. (3) The history of the seed crop from date of flowering to germination, including such things as size and frequency of cone crops, the relationship of type and size of tree to cone production, the distance of seed dispersal, and the viability of seed stored in the duff for various periods.

To study these problems there have been established 34 permanent plots, 1149 quadrats, 4696 tagged trees, 102 seed traps, several seed-stored-in-the-duff installations, and a large number of small plots of sowed seedling dealing intensively with specific causes of seedling mortality. Certain phases of the study have reached the point where definite conclusions can be drawn and where they can be curtailed, at least temporarily, in favor of more urgent phases of the white pine silvicultural problems. This is particularly

true of the intensive seedling mortality study and the more extensive quadrat study of rate of seedling establishment on cutover areas. The whole field of white pine silvicultural research was reviewed and considered during the past winter by the entire silviculture staff and as a result new project plans were prepared placing more stress on the important problem of seedling development. The completion of the analysis of all available white pine data and the preparation of the several bulletins now approaching completion, coupled with several personnel changes offered an excellent opportunity for a critical analysis of our program.

The following publications covering certain phases of this project are well along. (1) Haig's bulletin, "Factors Controlling Initial Establishment in Western White Pine", has been submitted to and accepted for publication by the Yale University in completion of the requirements for his doctorate. (2) Haig and Weidman's proposed U. S. Department of Agriculture Technical Bulletin, "Natural Reproduction of Western White Pine", is approximately 75% complete and will be ready for review and editorial criticism by early winter. (3) Haig and Wellner's proposed U. S. Department of Agriculture Technical Bulletin, "Method of Cutting; Its Effect on Reproduction in the White Pine Type", is 75% in final copy and should be ready for review by November 30 at the latest. The publication of these three bulletins will clear our present program for major silvicultural pub-

lications, although there remains unpublished material for numerous articles for the Journal of Forestry, Ecology, and Journal of Agricultural Research.

White Pine Methods of Cutting

Two permanent plots at Deception were added to the 26 previously established to determine the suitability of various methods of cutting in the white pine type. These two new plots investigate the possibilities of an entirely new approach to the problem of reducing the shade cast after cutting by the trees of inferior species which are left. Normally the amount of hemlock, white fir, and cedar overwood and understory must be greatly reduced if white pine is to become established and make satisfactory development. Using CCC labor, this sanitation work was done prior to the removal of the merchantable white pine to determine whether the light conditions thus created will favor immediate establishment of a fully stocked stand of white pine seedlings. As soon as the area is fully stocked with white pine seedlings all of the merchantable white pine will be removed in one clear cutting. It is highly desirable in this type that the interval between cutting and the closing of the canopy of the new forest be as short as possible in order that the high cost of ribes eradication and maintenance may be reduced to a minimum. If this method promises to shorten the period materially it will be repeated in the hopes that the lowered cost of ribes control will more than offset the additional cost of the silvicultural treatment.

Three additional methods of cutting plots will be established this year in connection with the sale of 1½ million feet of white pine lumber at Deception Creek. In this sale we are going back to the system of clear cutting in strips which was so successful on certain sites in early Forest Service timber sales. The main difference is that we are treating the reserved strip by removing the hemlock under and over story in the expectation that not only the clear cut strips but the reserve strip as well will reproduce and thus permit of removal of the reserve in a very few years.

The yield phase of this study is covered by the 28 plots already established, the new plots discussed above, and by a strip study of 32 old cuttings made by Haig several years ago. These data will be analyzed and prepared for publication next winter.

Ponderosa Pine Methods of Cutting

Other than the installation of 20 reproduction quadrats in the 3 permanent plots near Greenough, Montana, and their current examination, no further work on this project was done last year or is contemplated for 1935.

White Pine Growth and Yield

This project includes 31 permanent and 56 semipermanent plots, established mostly between 1922 and 1926. Remeasurements are made at five- and ten-year intervals to determine growth, yield and development of young stands.

Ponderosa Pine Growth and Yield

This study is a part of the interregional project for the preparation of even-aged normal yield tables by the Pacific Northwest Forest Experiment Station. Thirty-eight plots were established and measured by this station prior to 1934. During the past year data from 153 additional plots, of which 31 plots were in the Black Hills were secured. This makes a total of 275 plots, including the 84 selected by Mr. Behre some ten years ago, and provides an ample base for all sites and ages represented in this region. The data have been furnished to Mr. Meyer, who is responsible for the preparation of the interregional yield tables.

Larch-Fir Growth and Yield

This project was initiated in cooperation with Region One in 1932 to determine the rate of growth of residual stands of larch-fir. During the past year 56 temporary plots were added to 30 plots previously established. It is now planned to select and obtain data from about 50 additional plots during the late summer and fall and to analyze the data and prepare a report for publication next winter. The data are very badly needed for the growth phase of the Forest Survey and for silvicultural management on National Forest sales.

Work on the collection of data for the preparation of an even-aged normal yield table for this timber type is being initiated this season by the Forest Survey. A discussion of

this subproject appears in the statement for the growth phase of the Forest Survey and will not be repeated here.

White Pine Thinning Methods

Information as to proper thinning technique and the results with various ages and condition of stands is very meager indeed. Work under way by the CCC camps and with other emergency funds is being carried on with entirely too little basic information. To meet this need the Station has been establishing thinning plots whenever time could be found. Eleven plots were established between 1914 and 1926, 14 plots in 1933, and a Latin square installation, including 4 replications of 6 treatments and a check, as well as one individual plot with check in 1934. While too much emphasis must not be given to this phase of silviculture at this time it is essential that progress be made. One new series of thinning plots will be installed at Deception, using CCC labor during the current season.

The records from the remeasurement of the 11 plots established at Priest River during the early years of the Station will be analyzed and prepared for publication during this year.

Ponderosa Pine Thinning Methods

The only additional work done on this project during the past year was the remeasurement of 6 plots established on the Custer Forest in 1918 and 1921. No additional work is contemplated during 1935.

Botanical Studies

Progress is being made in establishing an arboretum at the Priest River Experimental Forest. Blocks varying from 1/4 to 1 acre in size have been laid out for planting with all coniferous species which will survive in this region. Prior to 1935 thirty-four blocks had been planted and 18 additional blocks were planted in the spring of 1935. The extreme drought of the past few years has caused heavy losses and has necessitated a large amount of replacements each year.

The racial variety plots of ponderosa pine from 18 widely separated localities established in 1911 to 1917 were all re-examined and remeasured last year and a detailed photographic record was secured. This material will be prepared for publication during the coming winter.

Reforestation

The Region One planting program is being greatly expanded by enlarging the Savenac Nursery to increase the output from 5 million to 15 million trees per year and plans have been made for the development of a second nursery in the white pine type on the St. Joe Forest.

Because of this increased activity in forest planting, it is essential that research in this field be reinstated after a lapse of several years. Under the proposed program it is planned to include not only the area suited for potential commercial production but a considerable portion of the denuded and non-restocked burns in the protection

type as well. Some 2 million acres must be planted. A large amount of research to determine the suitable species, best technique, and plantable site is needed.

FIRE RESEARCH

Results of research by the Northern Rocky Mountain Station devoted to fire control planning and to fire danger measurement have been found so satisfactory that they have been applied on the forests even before the facts could be published. This has been especially true in fire control planning where the methods originated and developed by Hornby were actually applied to whole groups of National Forests while they were being developed. These systematic methods of determining the man power and physical facilities needed for adequate fire control were so obviously superior to the former practice of furnishing coverage according to the opinion of local men that the National Park Service and some private and state timber protective organizations furnished the men for a similar study of their lands under Hornby's supervision before he had had time to complete the job for the National Forests.

As a result of the application of these systematic methods, the National Forests of Region One are now covered by lookouts, smokechasers, and transportation facilities to furnish reinforcements even more efficiently than in the past, and at a reduction of 20 percent in the annual cost of maintaining the fire control organization. The distribution

of fire control effort has also been improved so that expenditures are now in proportion to the probability of fires starting, the value of destructible resources, the rate of spread of fire, and the difficulty of control.

When such extensive and detailed work is done under pressure, as this was done, there are usually opportunities of refinement, and often minor phases possible of improvement, brought to light by the test of experience. It is therefore advisable to continue research in fire control planning for the next several years in order to insure full use and value from the basic work so well commenced. Some revisions of the methods may also be necessary in order to meet changed standards or objectives in fire control.

The research devoted to the measurement of fire danger has likewise been put into actual practice very extensively during the past year. Whereas the practice of burning road construction slash, smoking within the forest, entry of campers and tourists, and the expansion of the forest protective organization used to be determined solely on the basis of estimate and opinion of prevailing fire danger, these practices and some others are now largely controlled in Region One on the basis of fire danger measurements and the carefully computed class of fire danger. Like the systematic methods of fire control planning these research-developed methods of measuring fire danger put all forests on a uniform and scientific basis, reducing the element of guesswork to a minimum and thereby obviating the errors so

inherent in unstudied opinion.

The research-developed methods of measuring fire danger are not untested, however. Some of these methods have been used for over 10 years on some Forests, and even the more recently developed method of integrating the numerous factors of fire danger, by use of the danger meter, has been tested during the past two years on all the fire forests in Region One. Both the United States Indian Service and the Park Service are now using the methods of measuring fire danger developed by the Northern Rocky Mountain Forest and Range Experiment Station. Some 84 stations are using these methods throughout the country.

By use of these methods, and the system of rating fire danger on a numerical scale, it is now possible to express fire danger in easily understandable and comparable terms. This could not be done previous to the origination of these methods. This permits accurate description of the character of each fire season for either a single Forest or an entire region. On this basis it is possible to compare the results of fire control with the conditions encountered and thereby determine whether or not the fire control effort and expenditures have been efficient. Such a determination must be made by Regional Foresters, the Chief of the Forest Service, Congressmen, State Boards of Forestry, and Directors of private timber protective associations if they are to pass sound judgment upon the expenditure of funds for which they are responsible.

Although plans had been made for expanding several features of this fire research, which are in need of more investigation, additional funds have not been made available. The several phases of the project are therefore being continued with the existing facilities. By turning over to the Forests the responsibility for supervising the operation of their own stations, by eliminating all unessential phases of this project, and by other means, it has been possible to extend one feature of the work and to initiate one new and very important phase during the past year. The phase extended is the study of fire danger differences according to altitude and on north versus south slopes. The new study is an intensive investigation of the effect of vegetative condition on the rate of spread of fire. Both of these are basic to the accurate rating of fire danger and to the most efficient placement of men to insure adequate fire control at minimum cost.

RANGE RESEARCH

The rather liberal allotment of emergency funds for range research during the past year has enabled the station to make substantial progress in this field in spite of the small amount of regular funds available. Prior to 1934, major emphasis was placed on the project designed to determine the best management of short grass ranges in the northern Great Plains region with some experiments in artificial reseeding of plowed and abandoned dryland ranches. Under the emergency expansion the major project was materially strengthened and

the artificial reseeding project was attacked in a more nearly adequate fashion.

During 1934 the most serious drought of record was experienced in eastern Montana. The total precipitation at Miles City was only 5.51 inches or approximately 40 percent of the normal. This condition placed both the range management and artificial reseeding projects to the most severe test.

The value to the livestock operator of properly stocking range lands, especially during drought years, has been amply demonstrated. The three lots of 20 cows each and their pastures have now been used in this experiment for three years. One lot of cows has been grazed continuously on pastures of such size that for a normal year they were 25 percent overgrazed; one lot has been on pastures which were approximately properly grazed; and one lot has been on pastures which were about 25 percent under utilized. Although the average weight per cow of each lot differed by only about 8 pounds when the experiment started in 1932, those on overgrazed pastures have weighed consistently since that time 40 or more pounds per head less than those on the more lightly stocked pastures. At the close of the nearly normal 1933 season, this difference in average weight per head was nearly 90 pounds. In 1934 due to the extreme drought, it was necessary on July 20 to start feeding hay to the cows on the overgrazed pastures while those on properly grazed and understocked pastures did not require supplemental hay feeding until September 5 and September 14, respectively. By November,

when all cows were removed to the feed lot, the cows on overgrazed pastures had been fed more than a ton of hay per head while those on the undergrazed pastures had used less than 850 pounds.

The effect of overgrazing as shown by this experiment in 1933 and 1934 has been to reduce the calf crop from 97½ percent to 75 percent; reduce the average weight of calves at birth from 74.9 pounds to 68.4 pounds, and at weaning time from 300.7 pounds to 263.4 pounds; and to increase the average cost of calf weight produced from 2.44¢ to 3.84¢ per pound. Obviously the overgrazing of range land is extremely costly even when the effect on the vegetative cover is not considered.

The effect of the three intensities of use has not as yet been seriously reflected in the density of the plant cover. However, the drought of 1934 caused a reduction in the volume of forage produced to 25 percent of normal and in the density of cover to 72 percent of that for 1933. In certain forage types a reduction in density of as much as 70 percent is shown by a limited number of quadrats recharted during the current season. Thus overgrazing not only damages the range but significantly increases the cost of producing range cattle.

Results from the artificial reseeding project permit a preliminary conclusion that a very great part of the more than 4 million acres of plowed and abandoned dry farm land in Montana can be reseeded at a cost which will be justified

by increased carrying capacity and by reduced wind and water erosion. To date approximately 1,100 acres, in tracts of from 1 to 40 acres, have been seeded. Experiments with from one to twenty species of grasses are being conducted at Old Fort Keogh, in the Forest School nursery at Missoula, on several National Forests, and under cooperative agreements on privately owned plowed and abandoned dry farm land in 22 central and eastern Montana counties. About 425 acres of the test areas, seeded in the fall of 1933 and spring of 1934, mostly without soil preparation, suffered the full effect of the 1934 drought and yet success is indicated by incomplete examinations on more than 32 percent of the area. The plots sown in the fall of 1934 and spring of 1935 now promise to give 60 to 75 percent success.

While 20 species of grass are being used in this experiment, crested wheat grass, native to a locality of similar climate in Siberia, promised to be best suited to this region.

An increase of $20,000 in regular funds for Range Research becomes available on July 1, 1935. This will not only adequately finance the continuation of the cattle phase of the Short Grass Range Management study at Fort Keogh, but will provide for the initiation of a similar study with sheep. While it is not sufficient to finance desirable expansion in the very important artificial reseeding project, it will permit us to continue the intensive studies in this field now under way at Fort Keogh and in Missoula, as well

as the necessary examination of the plots on private owned and abandoned dry farm lands throughout eastern and central Montana.

One entirely new project will be initiated. Although some very valuable results have been secured in Region One from well planned and executed administrative studies, no formal research to investigate the best management of high mountain summer ranges on the National Forests has yet been undertaken. During the past year an area on the Beaverhead National Forest suitable for this purpose was selected jointly by the Supervisor, Region, and Experiment Station. An immediate start is being made to study this problem with both cattle and sheep. While funds will be too limited to permit of as effective work as is urgently needed, it is thought best to make the start in the hopes of more liberal appropriations next year.

FOREST PRODUCTS

The Inland Empire is primarily a forested region. Lumbering is and must continue to be the major industry. Approximately 35 percent of the 105 billion board feet of merchantable timber is privately owned. An average of 1½ billion feet of lumber is being cut each year. Sixty percent of the entire cut now comes from these private lands. Due to economic conditions and for lack of sound information on production costs and returns, most private operators are liquidating their investments in stumpage as rapidly as

possible by clean cutting. In parts of the region cutting has progressed so far that sustained yield management on anything like the present cut is already impossible. The field for economic investigations in forest management and utilization is broad and the critical situation at the present time demands increased study along this line.

Forest Products research, as now handled by the Northern Rocky Mountain Experiment Station, is designed to be of maximum service to the industry and the government in the field of economics in forest products production. The projects now under way are carried under the following main designations: (1) Logging and Milling Studies, (2) Woods and Mill Utilization, ( ) Species Utilization, (4) Wood Preservation, (5) Forest Statistics, and (6) Special Studies.

The logging and mill studies - (1) selective logging and (2) logging output studies - provide information on the important phases of forest products production. The final results of the selective logging studies will show for each commercial type in the region and for individual holdings, the cutting limits and the utilization standards necessary to provide a reasonable profit for the operator and leave the land in a productive condition for future yields. The logging output studies are designed to measure the output of new logging equipment and new logging methods. Eight selective logging studies have been undertaken - five in the

ponderosa pine type of western Montana, two in the white pine type, and one in the larch-Douglas fir type. During the past year the results of the A.C.M. 1932 study in the ponderosa pine type were made available in a bulletin published in cooperation with the University of Montana and the State Forester of Montana. This bulletin, "Application of Selective Logging to a Ponderosa Pine Operation in Western Montana", has helped materially in demonstrating to the operator who is liquidating his stumpage at a rapid rate the financial disadvantages of logging and milling the smaller trees. Through the study, an economic tree classification for ponderosa pine was evolved which aids the operator materially in selecting the trees to be cut. This information was made available for use in a trade journal article entitled "Why Selective Cutting of Ponderosa Pine Pays". During the year also, the data collected on a logging-milling study in the Idaho white pine type of North Idaho was compiled and analyzed and the results published in a trade journal article. This study gives the production costs and production values for the match plank and commercial lumber produced from white pine trees of different diameter. White pine trees below 13 inches in diameter breast high cannot be removed at a profit to furnish match plank and commercial lumber. This minimum cutting limit checked the one set up by the North Idaho Forest Practice Committee under Schedule C of the Code. In addition, the office compilation for a tie study in the

larch-Douglas fir type was completed and a rough draft of the scientific report prepared. The field and office work was completed for the logging output study on "tractor and arch" skidding in ponderosa pine and the results made available.

Plans for F.Y. 1936 contemplate the completion of the tie study in the larch-Douglas fir type and the publication of results. A new selective logging study in the Idaho white pine type will be inaugurated with plans to complete all phases of the study during the year. This study will furnish the production costs and values by tree sizes for the younger age classes of white pine lumber now being logged in many sections of the region. The accumulated results of the selective logging studies in western Montana will be applied to the operations of the Anaconda Copper Mining Company to determine the possibilities and limitations of sustained forestry practice on their timber lands. The A.C.M. Company is the largest private owner of timberland in Montana. The timber is being cut primarily to provide lumber and round mine timbers for the company's mines and smelters, but a good amount of commercial lumber is also produced each year. Logging output data on motor trucks and tractors will also be brought up to date during the year. The section of Forest Products at this Station has never received any of the emergency funds allotted to other projects so it is not seriously affected by the present financial situation. Plans for an increased program of work,

based on the use of emergency funds were made but these can be discarded without affecting the schedule of work planned above with the regular staff.

The woods and mill studies furnish information pertaining to overrun data, efficiency comparison of logging and mill equipment, waste investigations, and depreciation studies. The results of previous studies on overrun, sawmill efficiency, residual wood after logging, breakage in felling and depreciation through river driving, gravity chuting, and fire have been made available to the northwestern lumber industry. No special program of work was planned under this project during the past year and no additional work will be done during F.Y. 1936 other than the incidental time required for inquiries from various agencies concerning woods and mill utilization within this region.

The species utilization studies are designed to promote the good utilization of certain little-used species, thereby increasing the economic value of the source of our present timber supply. Bulletins on western hemlock, western larch, and white fir have been published as a result of cooperation by this office, the Forest Products Laboratory, and the Pacific Northwest and California Experiment Stations. Preparation of the manuscript on lodgepole pine has been postponed because of recent serious insect losses in the species and the present economic conditions in the lumber industry.

Cost data and other information resulting from the Regional wood-preserving studies have been widely used in treating telephone poles, fence posts, and stubs required in the construction and maintenance of Forest Service improvements. Other Federal agencies, as well as some commercial companies and private individuals, make use of the basic information obtained from these studies. Many of the service test studies have been under observation for a great many years and are providing the only reliable data that can be obtained on the durability of treated and untreated woods in actual service and the efficiency of various preservatives and methods of treatment. The project now includes 20 installations distributed widely throughout the region. More than 20,000 test timbers consisting of full-sized railway ties, telephone and electrification poles, pole stubs, fence posts, and mining timbers are included. During the past year eight installations were up for examination. These were examined and reports prepared. Collection of service records for treated and untreated timbers will be continued. Seven test installations are up for examination during F.Y. 1936.

Current data are obtained on the amounts produced, production costs, and selling values of the forest products cut and manufactured within the region. These data are used in figuring the sale value of Government owned timber by the Federal agencies in Washington, Oregon, Idaho and Montana. Statistical information is used extensively by the Government

agencies and the industry within the region in many special reports. The actual projects consist of (1) a canvass of all the sawmills and producers of miscellaneous timber products within the region to obtain the production figures on lumber, lath, shingles, and miscellaneous timber products, (2) the collection of lumber and timber products price statistics for northern Idaho, eastern Washington, and western Montana, in sufficient volume to indicate periodic trends in the selling price of lumber (wholesale and retail), stumpage logs, cedar products and ties, and (3) the collection of detailed logging and manufacturing costs from all of the important lumber companies in North Idaho, eastern Washington, and western Montana by personal contact. Statistics were collected and compiled for all the activities outlined above during the past year. There will be a continuation of all activities in the project during F.Y. 1936.

FOREST SURVEY

The Forest Survey organization of this Station plans as its first unit to cover the Inland Empire region of the Pacific Northwest. The Inland Empire region includes Montana west of the Continental Divide, Idaho north of the Salmon River, and Spokane, Stevens and Pend Oreille counties in northeastern Washington. Within this unit there are approximately 26 million acres of forest land to be covered by the Survey. The Inland Empire is primarily a forested region, approximately 78 percent of its gross area being forest land.

Lumbering and mining are the foremost industries within the region and many of the communities are entirely dependent upon the forests for their support. Cutting of the accessible forests has gone forward at such a rate that in some sections of the region sustained yield management under the present mill setup is already impossible. Forest fires have taken a heavy toll of the future timber supply and in parts of the region epidemic insect losses have been heavy. Profitable agriculture is limited to relatively narrow valleys and adjacent bench lands, and most attempts at farming in the cutover lands outside of these areas have been unsuccessful. Planned use of the land is becoming an increasingly important problem.

Collection of cruise data for the Survey was started in January, 1932. Field work on a small scale was initiated in May 1932. Since that time, the work has progressed on an increasing scale, both in the field and office. In 1933 a total of six field mappers were employed for part of the season. During the summer of 1934 an average of 30 men mapped in the field and cruised and about the same number were employed on office compilation during the winter and spring of 1935.

On the accompanying tabulation, under the heading "Percentage of Job Completed", are listed the four major divisions of the work of the Inventory Phase of the Survey. "Collection" represents the work of assembling and sorting the cruise information available from the various sources.

"Field Mapping" is the work of covering areas for which no satisfactory information is obtainable and supplying missing data such as age and site, on areas of mature timber where volume data alone have been obtained. "Adjustment Cruising" consists of checking the collected cruise estimates in the field, and adjusting them to a common standard. "Office Compilation" is the job of welding the mass of information obtained by collection and field work into a complete summary of volume and type area data for the entire acreage of forest land within the unit. The "Report" will be an economic discussion of the history and prospects of the timber industry within the counties involved.

The percentages as shown, give a fair picture of progress, but do not tell the whole story. Included in the time and money which have been spent on the project thus far, is a large amount for preliminary plans, training of personnel, development of methods and the purchase of cars and field equipment sufficient for an organization of thirty men. The project is now in such shape that it can realize on this investment, especially if the present organization can be held together. Neither do the progress percentages reveal the fact that the most difficult part of the unit has been completed, with respect to the field mapping and compilation. The area covered includes the most broken type conditions, as well as some of the most valuable timber land in the region. The latter class of land naturally deserves more careful con-

sideration than the rough back country areas included in the National Forests. On a large part of the back country, there is already sufficiently accurate coverage and very little, if any, adjustment to Forest Survey standards is needed.

On the accompanying map, the total area to be covered is outlined, and the area on which field work has been completed is shown in colors according to the year worked.

Cover maps for all of the area which has been covered to date are in final form. Photostat negatives have been made of each township. From these, either 1-inch or 2-inch-to-the-mile reproductions may be made. The plain positive prints show timber and other cover data by lines and type symbols. Colored maps show the above in color, in addition to the symbols. These maps are available at cost for distribution to those having use for them in township units, in either size, upon order. Considerable use is being made of the 2-inch type maps by the A.A.A. and other agencies. The information, while necessarily of an extensive nature, is filling a need for a cover map, of a degree of accuracy which will permit its use for extensive planning or land transactions involving large tracts of low value land. It is not designed for use where detailed information is desired on small tracts or where high values are involved. Work is also going forward on 1-inch-to-the-mile black line prints, which will be published in units of about 40 townships each, and

will show the cover types in more generalized form. These maps will give a good picture of the general cover types of the region.

It is expected that some preliminary statistical data can soon be released. Compilation work has progressed to the point of complete type acreage figures for two counties. Total volume figures are complete in one county, Benewah, in Idaho. These will be released by ownership classes, that is, "Large Private", "Small Private", "State", "County", "Federal", etc. No releases are to be made showing individual ownerships.

L. J. Cummings was selected to head up the Growth phase of the Survey and much preliminary work was done. Tentative work plans were made covering seven studies on growth and yield in the western white pine, ponderosa pine, larch-Douglas fir, and cedar types.

Forest products production statistics were compiled and the average annual rate of depletion was determined for this phase of depletion, separately by counties, for the region. Additional information was needed for the minor forest products, principally fuel wood and farm fence and pole material, and a survey has been made in North Idaho. Two men have been assigned to the Forest Insect Field Station at Coeur d'Alene to cooperate in making a check survey of the epidemic insect losses, by timber species, separately for the main drainage units within the region.

A preliminary check was made of the fire statistics available and plans formulated for obtaining the average annual loss from this source. Figures on the annual loss in acreage by fires in the different timber types are available over a long period of years. Changes in the type itself and in the stocking of the stands burned over, however, vary greatly with the tensity of the fire. Damage studies are therefore necessary in order to arrive at correction factors that can be applied to the Forest Survey data. Some data on this phase were collected by the field mappers which showed the acreage and volume losses by fire according to the survey type setup.

Considerable information was obtained on the requirements phase of the Survey through an analysis of the data previously collected through studies of building construction and contractors' records in the larger cities of the Inland Empire, and of the timber requirements of public utilities. A detailed report was made on the wood requirements for the Butte mines. The result expressed in amount of wood used per ton of ore mined and smelted should be applicable to other mining sections of the region. Work on the wood requirements for farm use was initiated in the spring of 1935. A questionnaire was sent out to all the farm owners covered by the detailed CWA canvass of 1934. Additional information was sought on this questionnaire to supplement the data obtained in the original canvass which dealt mainly with the farm home. During June a personal canvass was made of farms scattered through four counties in central North Idaho. In addition to the amounts by kinds of wood

used in the construction of the farm buildings, the information on lumber used in repairs and maintenance and the amount of other wood products used on the farm, including fuel, was obtained.

Regular survey funds are sufficient only to pay the salaries and expenses of the three regular members of the staff and meet the obligated share of the Station's overhead expense. Due to the very unsettled financial situation prevailing since April 1935, the emergency crews were not sent into the field until late in June. The present temporary organization includes 17 type mappers, 2 men on the insect loss survey, 2 men on growth studies, 1 man on cutting depletion and requirements, 2 draftsmen, and 1 office manager. In addition, there are three detailed forest officers, and four CCC boys.

With emergency funds now available until the end of September 1935, it is estimated that the present organization will type map in place in the field all of the remaining uncovered areas in Bonner, Boundary, Spokane, Latah, and Clearwater counties in North Idaho. If usable emergency funds continue to be made available during the next (6th) work period and there is a late fall season, it would be possible with the same organization to complete the type mapping in place in the remainder of the North Idaho counties and do the adjustment cruising in the three northeastern Washington counties. In addition, it would be possible to compile maps in final form for all the area mapped during the field season

and do considerable work on office compilation.

With the emergency funds now available the Insect Loss Survey crew should during the period July 1 to September 30, 1935, cover approximately half of the North Idaho unit. It is estimated that the survey in the North Idaho unit can be completed if emergency funds continue to be made available for the 6th work period (October 1, 1935 to March 31, 1936). The larch-Douglas fir yield table study crew should obtain about 30 percent of the field data needed for the table by September 30, 1935. An additional 30 percent of the field data could be collected this field season if emergency funds were made available for the next (6th) work period and the work on office compilation started. A canvass of the wood requirements for farm use can be completed for North Idaho, northeastern Washington, and western Montana with the emergency funds now available.

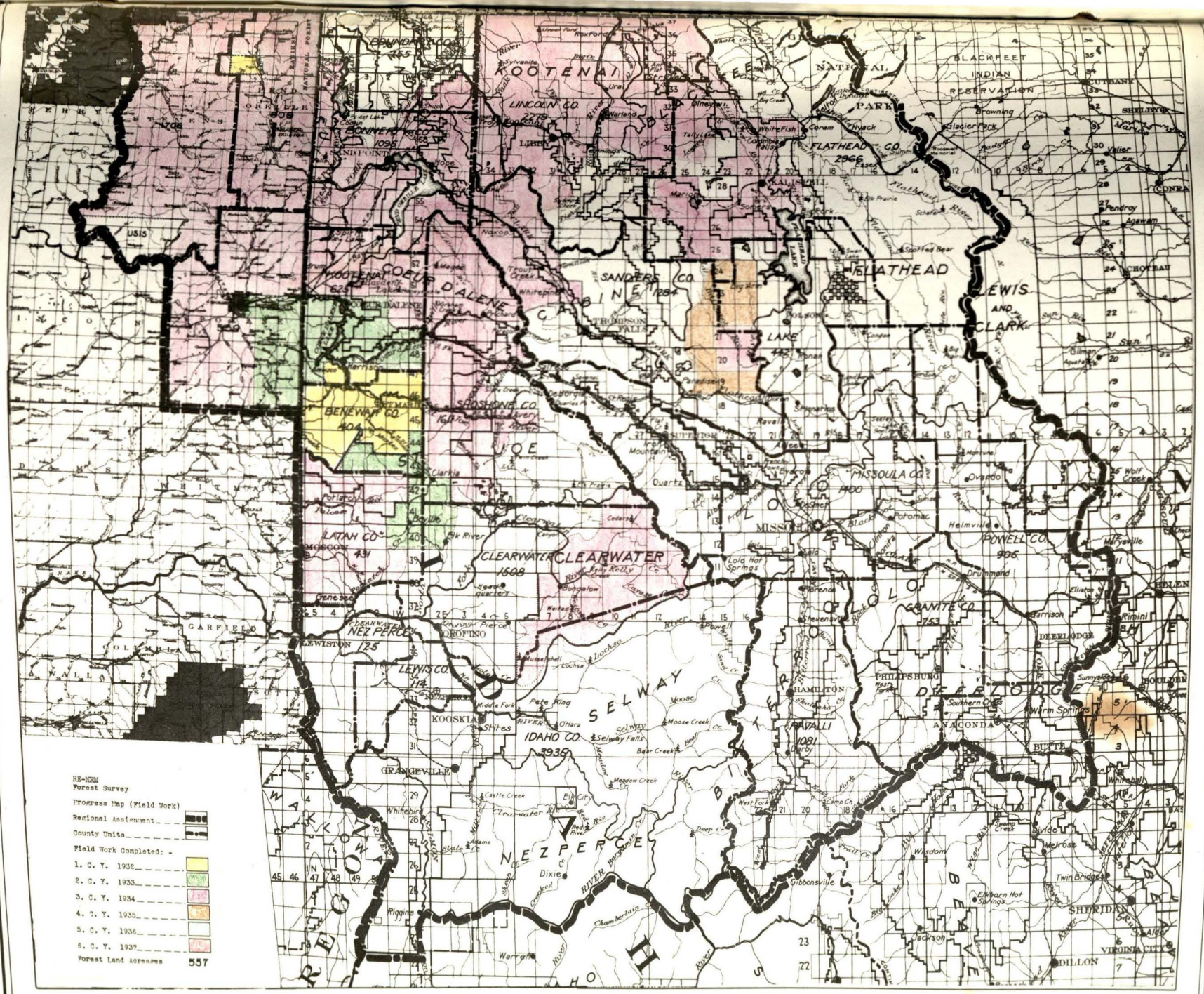
With the restrictions now in force, it appears improbable that much, if any, of the new ERA funds can be used to continue field work of the kind described above. The allotment per man per year is insufficient to keep the men traveling in the field even though men qualified to do the work could be found on the relief rolls. It is planned to use ERA funds when allotted to build up a map coloring organization and perhaps an office compilation crew.

NFRM
Forest Survey
Inland Empire

PROGRESS REPORT

as of: 7/1/35

UNIT	Est. Area Forest Land in M. Acres			Percentage of Job Completed				Report
	Inside N. Forests	Outside N. Forests	Total	Collection: Mapping	Field Cruising	Adj.	Office Compilation	
IDAHO								
Benewah	16	388	404	100%	100%	100%	90%	
Bonner	446	649	1,095	100%	85%		60%	
Boundary	417	338	755	95%	10%		--	
Clearwater	641	867	1,508	100%	35%		25%	
Idaho	3,490	445	3,935	90%	1%		--	
Kootenai	202	423	625	100%	100%		90%	
Latah	31	400	431	100%	97%		90%	
Lewis		114	114	100%	--		--	
Nezperce		125	125	100%	--		--	
Shoshone	977	634	1,611	100%	59%	100%	40%	
TOTAL IDAHO	6,220	4,383	10,603	97%	57%	18%	29%	
MONTANA								
Deerlodge	60	15	75	90%	--		--	
Flathead	1,843	1,123	2,966	100%	30%		15%	
Granite	620	133	753	75%	--		--	
Lake		442	442	90%	25%		--	
Lewis & Clark	140	80	220	90%	--		--	
Lincoln	1,655	624	2,279	100%	85%		50%	
Mineral	576	164	740	75%	--		--	
Missoula	567	833	1,400	85%	--		--	
Powell	515	390	905	95%	--		--	
Ravalli	928	153	1,081	80%	--		--	
Sanders	822	462	1,284	80%	25%		15%	
TOTAL MONTANA	7,726	4,419	12,145	95%	26%		15%	
WASHINGTON								
Pend Oreille	267	642	909	100%	100%		90%	
Spokane		559	559	100%	100%	100%	95%	
Stevens	64	1,642	1,706	100%	100%		90%	
TOTAL WASHINGTON	331	2,843	3,174	100%	100%	18%	91%	
TOTAL INLAND EMPIRE:	14,277	11,645	26,922	95%	40%	10%	29%	


KOOTENAI
LINCOLN CO
2278
BONNER CO
1095
SANDPOINT
BENEWAH CO
404
COEUR D'ALENE
SHOSHONE CO
LATAH CO
431
MOSCOW
CLEARWATER
1508
NEZ PERCE
LEWISTON
125
LEWIS CO
114
IDAHO CO
2936
GRANGEVILLE
KOOSKIA
Shites
Selway Falls
Dixie
Riggins
Warrens
FLATHEAD CO
2966
KALISPELL
Whitefish
Columbia Falls
Coram
Browning
Glacier Park
BLACKFEET INDIAN RESERVATION
PARK
SANDERS CO.
1284
THOMPSON FALLS
LAKE
442
FLATHEAD
LEWIS AND CLARK
MISSOULA CO.
1900
MISSOULA
Ovando
Potomac
Helmville
POWELL CO.
905
Drummond
GRANITE CO.
753
DEERLODGE
PHILIPSBURG
ANACONDA
BUTTE
Warm Springs
Southern Cross
HAMILTON
RAVALLI
1081
Darby
Stevensville
Florence
Missoula
Lolo Hot Springs
Bungalow
Genesee
Elk River
Clarkia
Bovill
Deary
Potlatch
Pierce
Orofino
Kamiah
Kooskia
Middle Fork
Pete King
Ohara
Moose Creek
Bear Creek
Meadow Creek
Castle Creek
Elk City
Red River
Whitebird
Grangeville
Cottonwood
Craigmont
Nezperce
Lapwai
Culdesac
Winchester
Gifford
Naxon
Spirit Lake
Rathdrum
Hayden Lake
Coeur d'Alene
Harrison
Medimont
Fernan
Worley
Plummer
Tensed
Bonners Ferry
Sandpoint
Priest River
Newport
Usk
Metaline Falls
Metaline
Ione
Cusick
Sullivan Lake
Sylvanite
Troy
Libby
Eureka
Rexford
Whitefish
Kalispell
Columbia Falls
Coram
Browning
Glacier Park
Valier
Conrad
Choteau
Pendroy
Agawam
Scapfed Bear
Big Prairie
Flathead Lake
Polson
Dayton
Somers
Kila
Evaro
Ninemile
Frenchtown
Huson
Petty Creek
Alberton
Superior
Haugan
Saltese
Tarkio
Trout Creek
Noxon
Heron
Clark Fork
Cabinet
Thompson Falls
Paradise
Quartz
Mullan
Wallace
Kellogg
Osburn
Silverton
Mace
Pinehurst
Smelterville
Kingston
Cataldo
Harrison
Medimont
Fernan
Worley
Plummer
Tensed
Bonners Ferry
Sandpoint
Priest River
Newport
Usk
Metaline Falls
Metaline
Ione
Cusick
Sullivan Lake
Sylvanite
Troy
Libby
Eureka
Rexford
Whitefish
Kalispell
Columbia Falls
Coram
Browning
Glacier Park
Valier
Conrad
Choteau
Pendroy
Agawam
Scapfed Bear
Big Prairie
Flathead Lake
Polson
Dayton
Somers
Kila
Evaro
Ninemile
Frenchtown
Huson
Petty Creek
Alberton
Superior
Haugan
Saltese
Tarkio
Trout Creek
Noxon
Heron
Clark Fork
Cabinet
Thompson Falls
Paradise
Quartz
Mullan
Wallace
Kellogg
Osburn
Silverton
Mace
Pinehurst
Smelterville
Kingston
Cataldo
Harrison
Medimont
Fernan
Worley
Plummer
Tensed
Bonners Ferry
Sandpoint
Priest River
Newport
Usk
Metaline Falls
Metaline
Ione
Cusick
Sullivan Lake
Sylvanite
Troy
Libby
Eureka
Rexford
Whitefish
Kalispell
Columbia Falls
Coram
Browning
Glacier Park
Valier
Conrad
Choteau
Pendroy
Agawam
Scapfed Bear
Big Prairie
Flathead Lake
Polson
Dayton
Somers
Kila
Evaro
Ninemile
Frenchtown
Huson
Petty Creek
Alberton
Superior
Haugan
Saltese
Tarkio
Trout Creek
Noxon
Heron
Clark Fork
Cabinet
Thompson Falls
Paradise
Quartz
Mullan
Wallace
Kellogg
Osburn
Silverton
Mace
Pinehurst
Smelterville
Kingston
Cataldo
Harrison
Medimont
Fernan
Worley
Plummer
Tensed
Bonners Ferry
Sandpoint
Priest River
Newport
Usk
Metaline Falls
Metaline
Ione
Cusick
Sullivan Lake
Sylvanite
Troy
Libby
Eureka
Rexford
Whitefish
Kalispell
Columbia Falls
Coram
Browning
Glacier Park
Valier
Conrad
Choteau
Pendroy
Agawam
Scapfed Bear
Big Prairie
Flathead Lake
Polson
Dayton
Somers
Kila
Evaro
Ninemile
Frenchtown
Huson
Petty Creek
Alberton
Superior
Haugan
Saltese
Tarkio
Trout Creek
Noxon
Heron
Clark Fork
Cabinet
Thompson Falls
Paradise
Quartz
Mullan
Wallace
Kellogg
Osburn
Silverton
Mace
Pinehurst
Smelterville
Kingston
Cataldo
RE-NRM
Forest Survey
Progress Map (Field Work)
Regional Assignment
County Units
Field Work Completed: -
1. C. Y. 1932
2. C. Y. 1933
3. C. Y. 1934
4. C. Y. 1935
5. C. Y. 1936
6. C. Y. 1937
Forest Land Acreages 557

EXPERIMENT STATION PERSONNEL

During the past year several changes in, and additions to, the regular Station personnel have been made.

The transfer to Washington of I. T. Haig after 12 years of intensive study of white pine silviculture, together with the desirability of reinstating reforestation research at this station, in order to keep pace with the greatly expanded Regional planting program being started, has necessitated a realignment of personnel in the Section of Silviculture. L. G. Hornby, who has previously had charge of and has completed the first major phase of the exceedingly difficult and complex fire control planning project, is now in charge of Silvicultural Research. R. H. Weidman, who has had charge of the work of this section will now devote his whole time to the reforestation and related phases. Kenneth Davis, who has been field superintendent at Deception Creek since the inception of that Experimental Forest, will be responsible for studies in the white pine type. Two emergency employees, Charles Wellner and George Fisher, will have charge of field crews in silviculture, and Corland James, a 1933 Idaho University graduate, has been made field superintendent of the Deception Creek Experimental Forest.

With the transfer of Mr. Hornby from Fire Research to Silviculture, Mr. Gisborne is being placed in charge of all fire studies, including the hour control project. It is hoped that a suitable man in the associate or full professional grade to specialize in fire control can be selected by next

winter.

The small increase in regular funds for the Forest Survey has made possible the selection and appointment of Laurence Cummings to handle the Growth phase of this project.

Several changes in the Range Research personnel have been or will be made. The transfer of Fred B. Kennedy to administrative work made possible the selection of E. J. Woolfolk as Superintendent of the Fort Keogh Station, and the material increase in regular funds enabled us to select and appoint Lincoln Ellison to the regular range research staff. Tentative plans for the selection of one additional regular range man are now being considered.

The selection of Mr. Bradner to act as the Assistant Director made it necessary that he be relieved of direct responsibility for the Section of Forest Products. I. V. Anderson was therefore placed in charge of this Section and the position vacated by his promotion has been filled by the transfer of E. F. Rapraeger from the Section of Forest Products at the Pacific Northwest Station.

EXPERIMENT STATION PERSONNEL

The station personnel as of June 30, 1935, is as follows:

Regular

Lyle F. Watts	Director
M. Bradner	Senior Forester
Leon C. Hurtt	Senior Range Examiner
R. H. Weidman	Senior Silviculturist
I. V. Anderson	Forester
H. T. Gisborne	Silviculturist
G. M. DeJarnette	Associate Forester
Lincoln Ellison	Associate Range Examiner
L. J. Cummings	Assistant Forester
C. N. Whitney	Assistant Forester
Kenneth P. Davis	Junior Forester
G. M. Jemison	Junior Forester
J. B. Thompson	Junior Forester
E. J. Woolfolk	Junior Range Examiner
L. G. Hornby	Regional Forest Inspector
M. J. Pershina	Senior Clerk
L. J. Hinton	Clerk-Stenographer
M. E. Bouchard	Assistant Clerk
Dagmar Duncan	Senior Stenographer

Emergency Work

Name	Title	Status
T. E. Rowland	Associate Forester	Appointed
Eric A. Anderson	Technician	Unappointed
Fred M. Benson	"	Appointed
Gordon T. Cornell	"	"
William W. Ensign	"	"
Herman O. Ficke	"	"
George M. Fisher	"	"
Alfred A. Flint	"	"
Joel Frykman	"	"
Wm. F. Guntermann	"	"
Lester L. Harris	"	"
G. Lloyd Hayes	"	"
Jess M. Honeywell	"	Unappointed
S. Blair Hutchison	"	Appointed
Corland L. James	"	"
Theodore Kachin	"	Unappointed
Elmer R. Marks	"	Appointed
Irwin C. Puphal	"	"
Eric G. Rutquist	"	Unappointed
Charles A. Wellner	"	Appointed

Name	Title	Status
R. J. Smith	Principal Forest Ranger	Appointed
Frank B. Casler	Forest Ranger	"
Joy M. Armstrong	Assistant Technician	"
Adrian Dodge	" "	Unappointed
Howard B. Hawk	" "	Appointed
Joseph N. Hessel	" "	"
Orlo B. Johnson	" "	"
Ralph L. Neafus	" "	Unappointed
A. B. Nugent	" "	Appointed
Carl E. Ostrom	" "	Unappointed
Hans Roffler	" "	Appointed
J. Franklin VanAlsburg	" "	Unappointed
Fred Waylett	" "	"
Ray L. Wrights	" "	Appointed
C. W. Branning	Draftsman	Unappointed
Larry H. Carnall	"	"
Lee Evans	"	"
R. E. Hofland	"	"
James Lynch	"	"
John MacMurry	"	"
Eugene V. Wagner	"	"
Stephen Webb	"	"
H. A. Pissot	Jr. Clerk-Stenographer	Appointed
James Hansen	Clerk	Unappointed
Claude Jones	Clerk	"
Mary-Alice McKittrick	Clerk	"
Frank A. Sell	Clerk	"
Orville Skones	Clerk	"
Grayce Tubbs	Clerk	"

*EXPENDITURES F.Y. 1935

Lines of Work	Regular Research Funds	Regional Contributions	Coop. Funds	Emergency Funds Resnira	Emergency Funds EOW Research	Emergency Funds Impnira
Forest Management						
Botany	249.96			273.09		82.29
Management White Pine	11173.45	3479.45		930.88	5103.72	3686.21
Thinning " "	370.17			41.60		121.89
Management Ponderosa Pine	203.52			733.91	2862.62	607.93
Thinning " "	32.78	290.00				
Mensuration White Pine	16.39	3437.47		665.97	2096.57	7.00
" Ponderosa Pine	651.55			720.00	2097.77	
" Larch fir	487.64			808.17	2039.77	
Pf-1 Attack	3597.44			800.00	4398.33	
Pf-2 Behavior	9903.51			1691.99	4064.57	3866.33
Special Studies	1741.08					
Total	28427.49	7206.92		6665.61	22653.35	8371.65
Range Investigations						
Mgt. Short Grass Ranges	4676.81			2507.93	12615.56	5969.32
Artificial Reseeding	1529.97				2000.00	2347.84
Total	6206.78			2507.93	14615.56	8317.16
Forest Economics						
Forest Survey - Idaho	5264.68	18771.58		2579.06	19872.66	
Montana	5165.85	7317.13		9499.42	17418.02	
Washington		4946.42			18147.48	
Total	10430.53	31035.10		12078.48	55438.16	
Forest Products						
Logging & Milling Studies	4499.35					
Wood Preservation	981.98					
Statistics	2731.45		669.17			
Special Studies	1746.05					
Contributed to Forest Survey	1566.26					
Total	11525.09		669.17			

* Distribution by projects is estimated as accounting records for fiscal year are not yet completed.

51 599

Form No. 1

RESEARCH PROJECT ALLOTMENT SHEET

Northern Rocky Mountain Forest and Range Experiment Station

Fiscal Year 1956

Subappropriations & Projects	Regular Research Funds	Regional Contributions	Co-op. Funds	Emergency Funds ECW Research
Forest Management Investigations				
Silvicultural Investigations				
M-1 White Pine	9844			7549
Mt-1 " "	1000			736
M-2 Ponderosa Pine	1100			829
Mt-2 " "	100			92
Mensuration Investigations				
ME-1 White Pine	767			1843
ME-2 Ponderosa Pine	589			1380
ME-3 Larch fir	569			1580
Forest Regeneration Investigations				
Botany	656			
Forestation	80			
Fire Protection Investigations				
Pf-1 Attack	5450			2206
Pf-2 Behavior	8175			7000
Total	28350			23015
Range Investigations				
Grazing Management Investigations				
Short Grass Ranges	12162			9207
Summer Ranges	8108			6076
Artificial Reseeding Investigations				
Artificial Reseeding	4130			3130
Total	24400			18413
Forest Products Investigations				
Production Costs & Utilization Inves.				
Logging and Milling	6387			
Species Utilization	105			
Woods & Mill Utilization	628			
Statistics of Production, Consumption and Distribution of Forest Products	3480		1000	
Investigation of Wood Treatments, Coatings, Paints, Glues, etc.	800			
Total	11600		1000	
Survey of Forest Resources, Present and Future Requirements	20000			34532
Total	20000			34532

Allotment Sheet
Fiscal Year 1942

Distribution of Salaries and Expenses of Regular Organization — Regular Appropriation

	Position & Classification grade	Name	Base Salary Rate Per Annum	Forest Management Allotment		Range Invest'gn. Allotment		Forest Products Allotment		Forest Survey Allotment		Forest Fire Coop. Allotment		Soil Eros. Invest. Allotment		Regional Contrib.	Coop. Funds	Quarters Deduction	Adm. Furloughs	Vacancy Savings
				Empl't Period Month	Base Salary	Empl't Period Month	Base Salary	Empl't Period Month	Base Salary	Empl't Period Month	Base Salary	Empl't Period Month	Base Salary	Empl't Period Month	Base Salary					
1	P-7	Director Watts, L. F.	6500	6½	3450	5½	3050													
2	P-6	Assoc. Dir. Bradner, M.	5600							12	5600									
3	P-5	Sr Forest. Anderson, I.V.	4600					12	4600											
4	P-5	Sr Silv. Gisborne, H.T.	4600	12	4600															
5	P-5	Sr Silv. Hornby, L.G.	4600	12	4600															
6	P-5	Sr Rge Ex. Hurtt, L.C.	4600			12	4600													
7	P-5	Sr Silv. Waldman, R.H.	4600	12	4600															
8	P-4	Rge. Exam. Vacant	3800			12	3800													
9	P-3	Assoc Silv. Davis, K.P.	3200	12	3200															
10	P-3	Assoc For. DeJarnette, G.M.	3200							12	3200									
11	P-3	As. Rge. Ex. Ellison, L.	3200			12	3200													
12	P-3	Assoc. Silv. Jemison, G.M.	3200	3	800				2667										2400	
13	P-3	Assoc. For. Rapraeger, E.F.	3200					10 12	~~3200~~											
14	P-3	Assoc. For. Whitney, C.N.	3200					3½	1000	5	1200						1000			
15	P-2	Asst. For. Cummings, L.J.	2600							12	2600									
16	P-2	Asst. For. Thompson, J.B.	2600	12	2480													120		
17	P-2	Asst. Rge. Ex. Woolfolk, E.J.	2600			12	2480											120		
18	CAF-7	Jr. Adm. Asst. Pershing, W.	2600			12	2600													
19	CAF-5	Senior Clk. Hinton, L.F.	2000					6	1000	6	1000									
20	CAF-4	Clerk Bouchard, M.	1800			7	1000			5	800									
21	CAF-4	Fr. Steno Duncan, D.	1800	12	1800															
22	CAF-2	Jr. Steno Vacant	1440			12	1440													
23																				
24																				
25																				
26																				
27																				
28																				
29																				
30																				
31																				
32																				
33																				
34																				
35																				
36																				
37																				
38																				
39																				
40																				
41																				
42																				
43																				
44																				
45																				
46																				
47																				
48																				
49																				
50																				
51																				
52																				
53																				
54																				
55																				
56																				
57																				
58																				
59																				
60																				
61																				
62																				
63																				
64																				
65																				
	Temporaries—Salary and Wages								9267											
		Totals			25530		22170		~~9800~~		14400									

Miscellaneous Expenses	Forest Mgmt.	Range Invest.	Forest Products	Forest Survey	For. Fire Coop'n.	Soil Eros. Invest.				
Supplies and Materials	220	310	100	800						
Communication Service	50	75	115	15						
Travel Expenses	2050 ~~1700~~	900	1433 ~~900~~	1700						
Transportation of Things (Service)	100	200	110	15						
Rents		420		2880						
Equipment	400	310	75	120						
All Other		15	500	70						
Totals	2820 ~~2470~~	2230	~~1800~~ 2333	5600						
GRAND TOTALS	~~28000~~	24400	11600	20000			1000	240	2400	

28350

Form No. 3

ESTIMATED DISTRIBUTION OF DIRECT
AND OVERHEAD EXPENDITURES

Northern Rocky Mountain Forest & Range Experiment Station

Fiscal Year 1936

Allotments	Forest Management	Range Investigations	Forest Products	Forest Survey	Total
	Dollars	Dollars	Dollars	Dollars	Dollars
Regular Research	28,350	24,400	11,600	20,000	84,350
ECW Research (1)	23,015	18,413		34,532	75,960
Total	51,365	42,813	11,600	54,532	610,310
Percent of Total	32.0	26.8	7.2	34.0	100.0
Proportionate Share of Overhead	6,219	5,208	1,399	6,607	19,433
Actual Distribution of Overhead	3,800	7,070	733	7,830	19,433
Percent (2)	19.5	36.4	3.8	40.3	100.0

(1) Estimate based on monthly rate of $6,330 for entire year.

(2) It is hoped that before the end of the year through personnel shifts or through unforeseen increases, the distribution of Station overhead can be brought more nearly in line with the correct prorata share by divisions of work.

PUBLICATIONS

PUBLISHED SINCE LAST REPORT

1. Match plank from western white pine trees. Anderson, I.V. The Timberman, April 1935.

2. Clean cutting of ponderosa pine versus selective cutting. Anderson, I.V. Journal of Forestry, November 1934, vol. 32, p. 886.

3. Why selective cutting of ponderosa pine pays. Anderson, I.V. The Timberman, September 1934.

4. Application of selective logging to a ponderosa pine operation in western Montana. Anderson, I.V. Bulletin #339 of Univ. of Montana, July 1934.

5. A comparison of long-log and short-log scale. Bloom, C.W. Applied Forestry Note no. 68, May 1935.

6. A method of determining spacing in thinning. Davis, Kenneth Journal of Forestry, vol. 33, January 1935, pp. 80-81.

7. Woodlands cut by the "selection method" less liable to fire damage. Gisborne, H.T. USDA Yearbook 1934, pp. 376-378.

8. Where is the forest meteorologist? Gisborne, H.T. The Michigan Forester, vol. XVI, June 1935.

9. When a "normal" is not normal. Gisborne, H.T. Bulletin of the American Meteorological Society, vol. 16, June-July 1935.

10. Shaded fire breaks. Gisborne, H.T. Journal of Forestry, vol. 33, 1935, pp. 86-87.

11. Paired minimum temperatures as indices of fair or foul weather. Gisborne, H.T. Applied Forestry Note no. 65, July 1934.

12. The rating of forest fire danger. Gisborne, H.T. Applied Forestry Note no. 67, January 1935.

13. Fuel type mapping in region one. Hornby, L.G. Journal of Forestry, vol. 33, January 1935, pp. 67-72.

14. Regrassing Montana dry farms. Hurtt, Leon C. Applied Forestry Note no. 69, June 1935.

15. Regrassing of dry farms in Montana. Hurtt, Leon C. The Hereford Journal, December 15, 1934, pp. 34-35.

16. Regrassing "upside down" range lands. Hurtt, Leon C. Montana Woolgrowers News Letter, January 1, 1935.

17. Overgrazing reduces cattle gains and increases production costs. Hurtt, Leon C. Applied Forestry Note no. 66, July 1934.

18. The role of western white pine in forest succession in northern Idaho. Huberman, M.A. Ecology, April 1935.

19. Beaufort scale of wind force as adapted for use on forested areas of the northern rocky mountains. Jemison, George M. Journal of Agricultural Research, vol. 49, July 1, 1934, pp. 77-82.

20. Idaho-Montana Lumber and Timber Products Production. (Preliminary statement based on returns from 1933 lumber census) Whitney, C.N. Newspaper and trade journal releases.

SUBMITTED FOR PUBLICATION

1. Selective cutting protects future value of farm woodlot. Anderson, I.V. USDA Yearbook, July 1934.

2. Comparative germination of tree species on various kinds of surface-soil material in the western white pine type. Fisher, George M. Ecology, May 1935.

3. Measuring fire weather and forest inflammability. Gisborne, H.T. Washington Office, February 1934 for government circular.

4. Fire control objectives and practices in the northern rocky mountain region. Gisborne, H.T. and Hornby, L.G. Washington office for review as technical bulletin.

5. Factors controlling initial establishment in western white pine. Haig, I. T. Accepted for publication as bulletin by School of Forestry, Yale University, April 1935.

6. Don't let a "normal" deceive you. Hayes, G. Lloyd Service Bulletin, June 1935.

7. Influence of weather factors on moisture content of light fuels. Jemison, George M. Journal of Agricultural Research, April 1935.

8. Timber growing and logging practice in the ponderosa pine type of the northwest. Weidman, R.H. USDA Technical bulletin, June 1934.

9. Idaho-Montana lumber production. (Preliminary statement based on returns from 1934 lumber census) Whitney, C.N. Newspaper and trade journal releases.

IN PREPARATION OR PROPOSED FOR F. Y. 1936

1. Log grades for ponderosa pine. Anderson, I.V. and Neff, P. The Timberman.

2. Production costs and selling values of railroad ties produced from the larch-Douglas fir stands of western Montana. Anderson, I.V. Technical bulletin by University of Montana.

3. Production costs, selling values, and utilizatcn facts in the manufacture of matches from western white pine. Anderson, I.V., Hubert, E.E. and Rapraeger, E.F. Technical bulletin, University of Idaho.

4. Basic information for the practice of selective logging in the ponderosa pine forests of the Inland Empire. Anderson, I.V. and Bradner, M. USDA bulletin.

5. Stumpage prices since 1912. Anderson, I.V. Revision of mimeograph circular--Applied Forestry Note.

6. Abundance of inferior logs left on ground after high grading experimental ponderosa pine area results in heavy damage to residual stand. Anderson, I.V. Applied Forestry Note.

7. The possibilities of sustained yield forest management in North Idaho. Bradner, M. Journal of Forestry.

8. Testing the reliability of height-over-diameter curves. Davis, K.P. Journal of Forestry.

9. Growth and yield data from permanent sample plots in western white pine stands. Davis, K. P. Journal Agricultural Research.

10. Volume increment on cut-over areas in the western white pine type. Davis, K.P. and Wellner, C.A. Journal of Agricultural Research.

11. Manual on stand improvement methods for the northern rocky mountains. Davis, K.P. and Region One. USDA miscellaneous publication.

12. Progress report on the forest resource survey. DeJarnette, G.M. Applied Forestry Note.

13. Progress report on the forest resource survey. DeJarnette, G.M. Applied Forestry Note No. 70.

14. Some effects of the 1934 drought on native vegetation of the northern Great Plains. Ellison, Lincoln and Woolfolk, E. J. Ecology.

15. Residual growth on larch-fir cutover areas in western Montana. Fisher, George M. Journal of Forestry.

16. Measuring fire weather and forest inflammability. Gisborne, H.T. USDA bulletin.

17. A ten-year record of lightning storms and forest fires in the northern rocky mountain region. Gisborne, H.T. Monthly Weather Review.

18. Rating of the character of the 1935 fire season in Region One. Gisborne, H. T. Applied Forestry Note.

19. Reproduction on cutover areas in the western white pine type. Haig, I.T. and Wellner, C.A. USDA bulletin.

20. Natural reproduction of western white pine. Haig, I.T. and Weidman, R.H. USDA bulletin.

21. Fire danger factors by altitude and exposure. Hayes, G. Lloyd Applied Forestry Note.

22. Fuel type mapping - its relation to forest fire control planning. Hornby, L.G. Northwest Science.

23. Forest fire control planning in the northern rocky mountain region. Hornby, L.G. USDA bulletin.

24. Cattle production costs are increased by overgrazing. Hurtt, Leon C. American Hereford Journal.

25. Cattle production costs are increased by overgrazing. Hurtt, Leon C. Applied Forestry Note No. 71.

26. Management of short grass ranges of the northern great plains. Hurtt, Leon C. USDA bulletin.

27. Range rehabilitation in Montana by cheap reseeding methods. Hurtt, Leon C. Livestock Journal.

28. Effect of vegetative condition on rate of spread of fire. Jemison, George M. Journal of Forestry.

29. Erosion follows the Selway fires. Watts, Lyle F. Journal of Forestry.

30. The northern rocky mountain forests; who should own them. Watts, Lyle F. Journal of Forestry.

31. Some effects of climate upon forests. Weidman, R.H. Scientific Monthly.

32. Differences in the progeny of ponderosa pine from various seed sources. Weidman, R.H. Journal of Forestry.

33. Treatment of farm fence posts. Whitney, C.N. The Montana Farmer.

34. Durability of cross-ties in Montana test tracks. Whitney, C.N. Applied Forestry Note.

35. Wood requirements per ton of copper ore mined in Montana. Whitney, C.N. Applied Forestry Note.

36. Forest statistics release for Benewah County, Idaho. (From the forest survey) Forest Survey staff.

37. Forest statistics release for Spokane County, Washington. (From the Forest Survey) Forest Survey Staff.

38. Forest statistics release for Kootenai County, Idaho. (From the Forest Survey) Forest Survey staff.

FINANCIAL PROJECT: Forest Management Investigations.

WORK PROJECT: Silvicultural Investigations.

RESEARCH PROJECT: M-1. Western white pine.

SCOPE: To determine the factors controlling regeneration, such as seed production, dissemination, storage, germination, survival, and seedling development. To determine suitable methods of cutting to secure satisfactory reproduction of the desired species, and the best development of residual stands.

STATUS: 1. Strip study of old cut-over areas: Field work on 32 areas between 1925 and 1928. Reproduction data secured on 2,145 quadrats. Increment records obtained from 2,814 residual trees on 158 plots. Shelterwood, seed-tree, and clear-cut areas included. Compilation and analysis completed and manuscript in first draft.

2. Permanent plot study: 34 plots established beginning in 1926, containing 1,149 reproduction quadrats, 102 seed traps, and 4,696 tagged trees. Reproduction and cone crops examined annually. Two installations of seed stored in duff; seed taken up and germinated annually for 8 years. An

intensive set-up of small sowed quadrats to determine the causes of mortality of seedlings conducted in 1932, 1933, and 1934.

RESULTS OF PAST YEAR: Regular annual examinations of all permanent installations. Experimental stand improvement work with CCC help at both Priest River and Deception Creek Experimental Forests. Noteworthy accomplishment in office work, including compilation and analysis of all records to date from permanent installations, yielding comprehensive data on seed storage, production, dissemination, germination, seedling mortality and survival. Completion of the intensive survival study and acceptance of the manuscript for publication. Preparation in rough draft of two additional publications, one of which is to be a bulletin on silviculture in the white pine type based on the data referred to above.

PLANS F. Y. 1936: As the important objectives of the study of germination, mortality, and survival are now reasonably well attained, the plan is to discontinue annual examinations on most of the reproduction quadrats and place emphasis on the study of competition, development and cultural treatment of the established reproduction. Accordingly, installations

to determine competition and development of the associated species are to be made on suitable existing quadrats and additional new quadrats. Furthermore about 30 small weeding plots at Priest River and 15 similar plots at Deception Creek are to be established in reproduction stands. Forty acres of large-scale experimental weeding with CCC labor is also to be done at Deception Creek. In addition the following installations will be made on the latter area: 3 plots devoted to strip cutting methods which will contain 80 reproduction quadrats and 40 seed traps; 4 plots including checks to test girdling methods of hemlock, with the necessary quadrats; 1 plot of pre-hemlock disposal by felling, with the required quadrats; 1 plot with quadrats on a 15-year-old cutting where the seed trees are to be removed and another plot where the seed trees will be retained longer. The regular annual cone crop, seed trap, and seed storage examinations on existing plots will be continued. A timber sale using appropriate methods of cutting is also proposed on the Deception Creek area.

ASSIGNMENT: L. G. Hornby and K. P. Davis.

RS-NRM

FINANCIAL PROJECT:	Forest Management Investigations.
WORK PROJECT:	Silvicultural Investigations.
RESEARCH PROJECT:	Mt-1. Western white pine.
SCOPE:	To determine suitable methods of thinning for securing the best growth and quality production in young stands.
STATUS:	A total of 25 plots have been established as follows: At Priest River Branch, 4 in 1914, 4 in 1919, 2 in 1925, 1 in 1926, 7 in 1933. At Deception Creek Branch, 7 in 1933. All plots have been remeasured at scheduled 5-year intervals. Records of all plots have been compiled to date and inscribed on atlas-size summary sheets.
RESULTS OF PAST YEAR:	Nine plots remeasured at Priest River. One new plot at Priest River and 8 new plots at Deception Creek established. One of latter plots is a Latin-square installation containing 16 pairs of thinned and check subplots. Establishment reports prepared and initial measurements compiled and transferred to summary sheets for all plots.
PLANS F. Y. 1936:	Four plots to be established at Priest River and 6 plots in younger stand at Deception Creek. Three plots to be remeasured.
ASSIGNMENT:	L. G. Hornby and K. P. Davis.

RS-NRM

FINANCIAL PROJECT:	Forest Management Investigations.
WORK PROJECT:	Silvicultural Investigations.
RESEARCH PROJECT:	M-2. Ponderosa pine.
SCOPE:	To study methods of cutting and regeneration.
STATUS:	Three selective logging plots established in 1932 at Greenough, Montana, 35 miles from Missoula. A cooperative undertaking between silviculture and products members of Station staff, the Regional office of Management, and several State and private agencies. Silvicultural participation consisted of helping in the planning and establishment, in taking tree diameters and descriptions, and in marking the silvicultural selection plot. Entire responsibility for periodic remeasurements to rest with silviculture section of staff.
RESULTS OF PAST YEAR:	Annual examination of 20 reproduction quadrats and check of mortality of reserved trees.
PLANS F. Y. 1936:	Annual examination of reproduction quadrats and check of reserved trees.
ASSIGN-MENT:	L. G. Hornby.

RS-NRM

FINANCIAL PROJECT:	Forest Management Investigations.
WORK PROJECT:	Silvicultural Investigations.
RESEARCH PROJECT:	Mt-2. Ponderosa pine.
SCOPE:	To determine suitable methods of thinning for securing best growth and quality production in young stands.
STATUS:	Seven thinned and two check plots were established with CCC help in 1933 on Mill Creek administrative site near Frenchtown, Montana. This area, which is on the Lolo N. F. 20 miles from Missoula, is covered with a dense, 50-year-old, second-growth stand.
RESULTS OF PAST YEAR:	Remeasured 6 thinning plots on the Custer N. F. established by forest officers in 1918 and 1921. All measurements compiled and recorded on atlas-size summary sheets.
PLANS F. Y. 1936:	Preparation of office report on Custer plots.
ASSIGN-MENT:	L. G. Hornby.

FINANCIAL PROJECT: Forest Management Investigations.

WORK PROJECT: Mensuration Investigations.

RESEARCH PROJECT: ME-1. Western white pine.

SCOPE: To prepare normal yield tables and to work out application of such tables to natural stands. To study, on permanent sample plots, the growth and development of understocked and fully stocked stands from youth to maturity.

STATUS: Total of 31 permanent and 56 semi-permanent plots, established mostly between 1922 and 1926. Remeasured at 5 and 10-year intervals. One pair of plots will supply information on pruning of butt log. Two plots are devoted to growth in over-mature stands and one to growth in almost pure cedar. Two check plots for thinning serve as additional yield plots. Normal yield table bulletin was published in 1932. Permanent plot records to date have been compiled and transferred to atlas summary sheets.

RESULTS OF PAST YEAR: One permanent yield plot established in 20-year-old stand at Deception Creek. Four new check plots for thinning established during year will serve as yield plots also. Compilation of all measurements up to date.

PLANS F. Y. 1936: Remeasurements to be made of 7 permanent plots at Priest River and of 25 semi-permanent plots near Clarkia. No new plots. Progress report on growth and yield plots.

ASSIGNMENT: L. G. Hornby and K. P. Davis.

RS-NRM

FINANCIAL PROJECT: Forest Management Investigations.

WORK PROJECT: Mensuration Investigations.

RESEARCH PROJECT: ME-2. Ponderosa pine.

SCOPE: To collect data in even-aged stands for the inter-regional yield tables to be prepared by W. H. Meyer. Remeasurement of permanent and semi-permanent plots to study growth and development of such second-growth stands.

STATUS: Project started in 1932 when 33 temporary plots were taken in western Montana. In 1933, three permanent yield plots were established with CCC help near Frenchtown, Montana, one of which was pruned. In addition two check plots for thinning also established at Frenchtown in 1933 will serve as yield plots.

RESULTS OF PAST YEAR: Temporary plots taken in 1934 included 122 in Region 1 and 31 in the Black Hills for Region 2. Volume measurements were taken on 173 trees in even-aged young stands from 35 to 125 years old. More than half of the yield plots taken are suitable as semi-permanent plots for remeasurement.

PLANS F. Y. 1936: No additional work contemplated.

ASSIGNMENT: L. G. Hornby.

RS-NRM

FINANCIAL PROJECT:	Forest Management Investigations.
WORK PROJECT:	Mensuration Investigations.
RESEARCH PROJECT:	ME-3. Larch-fir.
SCOPE:	Increment study of residual stands after selective cutting and preparation of yield tables for such stands. Growth and yield study of even-aged stands.
STATUS:	Thirty temporary plots taken in 30-year-old cuttings near Kalispell in 1932. Compilation of data in 1933. One permanent larch yield plot and three permanent Douglas fir yield plots established at Priest River in 1916 and 1926 and remeasured at 5-year intervals.
RESULTS OF PAST YEAR:	Fifty-six temporary plots taken in 25 to 35-year-old cuttings northwest of Kalispell. Core counts of all residual trees made and diameters at 10-year intervals since cutting recorded on office compilation sheets.
PLANS F. Y. 1936:	Field work in even-aged stands for normal yield tables as part of growth phase of forest survey. Compilation of normal yield data and residual growth data.
ASSIGNMENT:	L. G. Hornby on residual growth study. L. J. Cummings on normal yield study.

RS-NRM

FINANCIAL PROJECT: Forest Management Investigations.

WORK PROJECT: Forest Regeneration Investigations.

RESEARCH PROJECT: Botany

SCOPE: Arboretum at Priest River to test exotics and non-native species for adaptation in northern Idaho. Plantation at Priest River testing races of ponderosa pine from 19 localities ranging from Black Hills to Siskiyou Mountains and from Idaho to Arizona. Thirteen phenological stations in Montana and northern Idaho to obtain knowledge on seasonal vegetative events.

STATUS: Arboretum blocks are 1/4 to 1 acre in size; the first 4 blocks planted in 1932 and 24 additional blocks in 1933. Due to severe drought of these years, losses varied from 8 to 100 percent by species, necessitating heavy fail-place planting. Four large blocks planted in 1933 with deep and shallow rooted local species set in alternate rows. The racial plots of ponderosa pine were established from 1911 and 1917 and reported upon by Kempff in 1927. Phenology stations established in 1928 and observations annually by local forest officers, with partial compilation of 5-year records in 1933.

RESULTS OF PAST YEAR: In arboretum 6 new blocks planted and about 6,000 trees planted in fail places in existing blocks. Periodic examination of ponderosa pine racial plots. Transfer of all phenological records to date on cumulative record cards.

PLANS F. Y. 1936: Arboretum planting in 18 new blocks and fail-place planting in 20 existing blocks. Continue phenological observations. Compile records of ponderosa pine racial varieties plots and prepare report for publication.

ASSIGNMENT: R. H. Weidman.

RS-NRM

FINANCIAL PROJECT: Forest Management Investigations.

WORK PROJECT: Forest Regeneration Investigations.

RESEARCH PROJECT: Forestation. Western white pine.

SCOPE: The Region 1 planting program is being stepped up from 5,000 to 20,000 acres a year. Some 2 million acres ultimately must be planted. The present average survival is only 65 percent. Early planting research was mainly concentrated on nursery methods. The need is for adequate research to embrace: (1) causes of mortality and remedies in field planting; (2) adaptability of species to given sites; (3) possibilities of direct sowing; (4) best source of seed involving consideration of parentage in seed collecting; (5) more effective tools and methods in field planting technique; (6) investigation of nursery problems in preparing planting stock to be better fitted for field survival.

STATUS: New project. Background to be administrative planting experience and problems, and the early planting research conducted by Wahlenberg and his predecessors.

RESULTS OF PAST YEAR: None.

PLANS F. Y. 1936:	Thoroughly consult the administrative and research file records and existing literature. Orientation field trips. Make preliminary survival examinations on old administrative plots. Prepare working plan.
ASSIGNMENT:	R. H. Weidman.

RS-NRM

FINANCIAL PROJECT: Forest Management Investigations.

WORK PROJECT: Fire Protection Investigations.

RESEARCH PROJECT: Pf-1 Attack - Fire control planning.

SCOPE:

(a) Analysis of Region One fire reports.

(b) Detection.

1. Permissible size of blind spots, by fuel types.
2. Length of and interval between observations, by fuel types.
3. Effective observation distances.
4. Methods of determining the most efficient placement of lookout stations.

(c) Initial attack on fires.

1. Methods of determining the most efficient placement of smokechasers.
2. Determination of satisfactory strength and speed of attack by fuel types.

(d) Reinforcement.

1. Determination of the transportation system required by each fuel type to supply the number of men needed according to distance which men must be transported, and the time allowable if control standards are to be met.

(e) Fire control plans.

1. Evolution of a method of planning the fire control organization needed to achieve the goal of protection established. This method must be applicable on any Forest in Region One so that detection, initial attack, and reinforcement will be adequate for the fuel types and weather conditions, and will be similar on all Forests having similar frequency of fires, destructible resources, rate of spread of fire, and resistance to control.

STATUS: (a) Manuscript report covering analysis of fire reports 1921-30 completed in 1932, reviewed by Regional officers, revised in 1933, and used as a background and basis for (b), (c), and (d). As fire control facilities and practices have changed so materially since 1930 this report will be published only if it is believed to be of historical value.

(b) 1. Completed except for checking by experience.

2. Untouched as yet.

3. Practically completed by Drs. Shallenberger and Little who are now preparing their report and who are finishing the construction of six visibility distance meters. A

few final tests of their delineations of visibility distance are to be made under different atmospheric conditions in 1935. The six meters will also be thoroughly tested in 1935 and final improvements made before offering this device for field use.

4. Covered in following paragraph.

(c) (d) (e) Methods of selecting the most efficient lookout stations, of determining placement of smokechasers, strength and speed of attack, and transportation systems needed, have been devised and tested by actual application on the 14 million acres comprising the 10 fire forests in Region One. Gradual improvements will be attempted on the basis of experience during the next several years.

RESULTS: The results of this research were so urgently needed that they have been applied on nearly 16 million acres of private, State, National Park, and National Forest land even before a final report could be published. This has resulted on the National Forests in an increase in efficiency of coverage and a decrease of over 20 percent in the cost of the organization formerly believed to

be needed for satisfactory coverage. An article on the special phase of fuel type mapping was published in the January, 1935, issue of the Journal of Forestry. Another on this same phase of the work is ready for submission to Northwest Science. A complete report on all phases is about to be mimeographed for early distribution to Region One forest officers. A final report for Departmental publication will be prepared next winter.

PLANS: Analysis of Region One fire reports for 1931-1935, inclusive, should be made in 1936, and the results made available to Region One field men before the 1937 season.

Although the major purpose of fire control planning research has been largely fulfilled by the application of these studies to the fire forests of Region One, certain phases are still to be undertaken and there will undoubtedly be possibilities of refining the methods as a result of actual trial over a period of years. Both office and field studies are needed to determine the relative efficiency of stationary and moving detectors. The classification of fuel types also must be pushed actively until detailed and illustrated instructions are available for all fuel type mappers and checkers.

This is especially important because uniformity of application of fire control planning is dependent upon strict uniformity of fuel type mapping. These phases and the periodic analysis of Region One fire records will require the full time of one man. Hornby is being transferred to other work but it is planned to fill his former position and to continue this extensive and extremely practical project as soon as funds are available.

ASSIGNMENT: H. T. Gisborne, with the assistance of someone yet to be selected.

FINANCIAL PROJECT: Forest Management Investigations.

WORK PROJECT: Fire Protection Investigations.

RESEARCH PROJECT: Pf-2 Behavior - Measuring the daily and seasonal variable of fire danger.

SCOPE:

1. Cooperation with Weather Bureau in obtaining better forecasts. Development of inexpensive meteorological instruments.

2. The occurrence and characteristics of lightning storms.

3. (a) Developing methods of measuring fuel moisture.

   (b) Determining the effects of each of the weather elements on fuel moisture.

   (c) Correlating fuel moisture with inflammability and fire behavior.

   (d) Determining effect of condition of green vegetation on rate of spread of fire.

   (e) Determining differences in fire danger factors according to amount of shade, elevation, and North vs South slopes.

   (f) Integrating all factors of fire danger.

4. Supplying instruments and supervising the operation of all stations using the Northern Rocky Mountain methods of measuring forest fire danger.

STATUS: 1. Cooperation with Weather Bureau continued. A study was made by Jemison of the Beaufort scale of wind force and new indices of velocity determined. (See Results). Summary published in Journal of Agricultural Research, Vol. 49, No. 1, July 1, 1934.

2. Discontinued the detailed study of characteristics of lightning storms as analysis of the records for 1929-33 added very little new information to that obtained from the records for 1924-28. A record of storm occurrence is being continued for Forest Service and Weather Bureau use.

3. (a) No new methods developed during 1934. Minor improvements made in duff hygrometers, wood cylinders, and fuel hygrographs. A wire screen was designed and tested for shading the exposure of duff hygrometers and wood cylinders so that hereafter all stations will use the same amount of shade. Six additional fuel hygrographs used at Priest River. This instrument still too delicate and complex for use except by research men.

(b) Jemison's as yet unpublished analysis of records (see Results) produced useful results but indicated desirability of further records and analysis.

(c) Study made in 1934 of spread of fire resulting from embers or spots blown ahead of the

main fire (see Results). More work is needed on this phase of the project. A much needed study of the fundamentals of combustion under forest conditions was planned for 1935 but has been dropped due to lack of funds.

(d) Closely related to (c) this phase deals mainly with the effect of vegetation on rate of spread of fire. A preliminary study was made in 1934 and the experience used by Jemison in preparing a detailed work plan for a very thorough investigation extending over several seasons. Although the expected funds did not become available, Jemison has been assigned nearly full time to this phase and will continue work on it under a Pack Fellowship at Yale during the winter of 1935-36. The important chemical analysis of the many plants cannot be made, however.

(e) The available data concerning effect of shade were analyzed by Jemison and a summary published in the April 1934 issue of the Journal of Forestry. The extension of this work to include North and South slopes at elevations from 2,700 feet to 5,500 feet, as stated in the plans last year, was carried out by the installation

of 3 pairs of stations equipped with rain gages, hygro-thermographs, and fuel hygrographs.

A study of conditions from the ground level up through and above a forest canopy was planned, but had to be dropped due to lack of funds.

(f) The integration of all factors of fire danger by use of the fire danger meter was improved by revision of the meter and a new supply of meters was made and distributed. (See Results).

4. A training camp was held for one week at the Priest River Station in April 1935 attended by one or more assistant supervisors and/or fire dispatchers from each of the fire forests in Region One. Hereafter each Forest will be held responsible for training its own fire-weather observers and for the accuracy of their measurements.

As one result of this meeting many additional orders were received for duff hygrometers, wood cylinders, wire screens, and wind gages which the Experiment Station furnished at cost plus handling charges. There are now 84 stations using the Northern Rocky Mountain Station method of measuring fire danger and requiring annual calibration of duff hygrometers and/or wood cylinders.

This work entails several man months of painstaking work each year.

The supervision of the operation of stations, providing satisfactory record forms, checking of records, and field inspection requires from two to three months of Gisborne's time annually. Gisborne has prepared a manual describing the technique of the field work. This has been edited and has been forwarded to Washington for final review and publication as a Departmental bulletin. Its use should decrease the supervision of stations now required.

RESULTS: 1. The reporting of weather data has been greatly improved by - (a) the new indices of wind force for use with the Beaufort scale, (b) the addition of more than 50 rain gages bringing the total to about 450, and the addition of about 25 wind gages bringing the total to 180, (c) the addition of two or three new stations entirely equipped by the Weather Bureau bringing the total to 19 first class forest stations. The regional rain map for July and August 1934 gave valuable information concerning that fire season.

2. An analysis has been completed of the lightning storm reports from 150 lookout stations on all the National Forests in North Idaho and western Montana during 1924 to 1933, inclusive. One summary of the

features of practical application will be made for field use in Region One, another will be prepared covering the features of value to meteorologists.

3. Jemison's report "The Significance of the Effect of Stand Density Upon the Weather Beneath the Canopy" shows clearly the reasons why clear cutting should be avoided and why brush disposal operations should preserve all the shade of residual trees.

A detailed statistical analysis was completed by Jemison showing the correlation of the various weather elements with duff or wood moisture. The findings are basic to an understanding of (1) the effect of weather on inflammability, (2) the weather elements that can best be used as indices of inflammability, and (3) the weather measurements that should be continued and those that could be discontinued in future fire-weather research. The best index found was the ratio: $\frac{\text{Relative Humidity}}{\text{Temperature}}$.

A manuscript report was prepared by Gisborne, following his study of the Avery fire, which pointed out (1) the chief sources of embers that start, (2) the principal fuel ignited by these embers, and (3) the only method of fighting such spread. Short articles on "Shaded Fire Breaks", "When a Normal is Not Normal","Where is the Forest Meteorologist", and "Woodlands Cut by the Selection Method Less Liable to Fire Damage", by Gisborne, were published

in the Journal of Forestry, the Bulletin of the American Meteorological Society, and the Michigan Forester, and the Department of Agriculture Yearbook for 1934, respectively. The outstanding progress of the year in the application of results of fire research occurred when the Regional Office early in 1935 issued instructions to all fire forests to (1) control all debris disposal, (2) stop smoking on the forests, (3) require entry permits, (4) close the forests to entry, and (5) take other action as indicated by the danger meter, according to measurements of fire danger. This action culminates three seasons of more or less spasmodic trial of the danger meter and the measurements which it employs.

This is, now, merely the beginning of a thorough trial which must be continued over a period of years, including both easy and critical fire seasons, before final judgment can be passed on this product of research. There is the probability that changing standards of fire control, such as the recent policy to control all fires before the beginning of the next burning period, may require changes in the action recommended by the meter for each class of danger.

PLANS: The status of the various phases of this project, outlined above, should be continued without

any exceptional expansions or contractions.

ASSIGN-
MENT:

H. T. Gisborne, assisted by (1) G. M. Jemison, who will give most of his time to the study of effect of green vegetation on rate of spread of fire, (2) G. L. Hayes, who will concentrate largely on the fuel hygrograph operation and records, and (3) one other, who will calibrate duff hygrometers and wood cylinders and operate the four major weather and inflammability stations at Priest River.

RR-NRM

FINANCIAL PROJECT: Range Investigations.

WORK PROJECT: Grazing Management Investigations.

RESEARCH PROJECT: Short grass ranges.

SCOPE: Determine the correct utilization practice for yearlong cattle ranges in the short grass region, from the standpoint of the requirements of vegetation and soil maintenance, but with full recognition of the economics of livestock production. Stability, balanced use of range and supplemental feeds, reduced livestock production costs and the minimum size of an economic range livestock unit are all phases of this problem of proper land use in the short grass plains which require definite range research data.

STATUS: In July, 1932, at old Fort Keogh 60 cows divided into three lots of 20 each, were started on utilization tests on 12 fenced experimental range pastures aggregating 1,847 acres divided into three intensities of yearlong grazing. Until July 20, 1934, each of the three lots of cows had exactly the same care, watered at the same wells, and had the same supplemental winter feed so that

different intensity of use of the range was the only variable. Due to the extreme drought of 1934, it was necessary, to prevent starvation losses, to resort to supplemental hay feeding on July 20, September 5, and September 14, for the cows on overgrazed, properly grazed, and lightly grazed ranges, respectively. All cows were moved from the pastures to the feed lot in November, 1934, but were returned to their pastures for calving on April 2, 1935. With the exception of this November to April period the cows had not been off their range pastures since July, 1932.

Weights of the cows have been taken at 28-day intervals and their calves at 28-day intervals beginning with the day of birth and ending when they are weaned and removed from the pastures.

The effect of intensity of use on all of the important subtypes of vegetation is being studied through periodic charting or other examinations of some 61 quadrats and other vegetation plots.

In December, 1933, an area of 29.09 acres of sage brush land on Tongue River was fenced, and divided into areas for differing treatments. The object of this subproject is to determine

the effect of burning and grubbing of sagebrush on the establishment of a grass cover by artificial and natural means under both complete protection and moderate use by livestock.

Two transects with 53 circular plots were established to study the effect of various treatments on the sagebrush and cactus population.

RESULTS OF PAST YEAR

Although there was less than eight pounds variation in the average weight of the cows, in each of the three lots, at the beginning of the experiment, the cows on the overgrazed pasture each subsequent year have been 40 or more pounds lighter than the average of those on the properly and lightly grazed pastures and were 90 pounds lighter at the close of the relatively normal 1933 summer season. Not only has the weight of the cows on the overgrazed pastures been consistently less, but also the percent of calf crop, weight of calves at birth and at weaning time, and cost of range and supplemental seed has been adversely affected.

The following table briefly summarizes the effect of overgrazing, especially during the extreme drought of 1934, on range livestock production results.

COMPARATIVE CALF CROPS, CALF WEIGHTS AND AMOUNT AND COST OF RANGE AND HAY USED FOR THREE INTENSITIES OF GRAZING DURING 1933 and 1934 1/

	Twenty (20) Cows in Lot 1: Overgrazed Range	Twenty (20) Cows in Lot 2: Moderately Grazed Range	Twenty (20) Cows in Lot 3 Lightly Grazed Range
No. live calves born, two years	30	39	32
Percent calf crop, ave. two years	75%	97½%	80%
Weight of calves at birth, average two years	68.4#	74.9#	71.5#
Weight of calves at weaning, average two years	(30) 265.4# 2/	(37) 300.7# 2/	(31) 309.2# 2/
Weaning weight, prorated to 20 cows, average two years	197.6#	278.1#	239.6#
Average range acres per cow	23.1	30.5	38.8
Pounds hay fed winter 1932-33	430	430	430
Pounds hay fed winter 1933-34	170	170	170
Average hay per cow, two winters	300	300	300
Pounds hay summer 1933	None	None	None
Pounds hay summer 1934 (drought)	2027	1267	848
Cost of hay and range per pound of calf weight produced 1933	1.52¢	1.57¢	2.32¢
Cost of hay and range per pound of calf weight produced 1934	8.5¢	3.5¢	3.9¢
Weighted average cost per pound, two-year	3.84¢	2.44¢	2.83¢

1/ An $8 instead of the prevailing drought price of $20 per ton for baled hay and of 10¢ rental per acre for range is used above. The actual period is from December , 1932, to October 18, 1934, six weeks short of two full years because of the drought.

2/ Number of calves at weaning time for two years in parenthesis.

Records of a detailed nature from more than 61 quadrats, and a large number of clipping and other sample plots, showed a reduction of 38 percent in density of vegetation in 1934 as compared to 1933. This reduction up to 1934 was not significantly greater for overgrazed than for moderately grazed pastures. The full effects of the 1934 drought were not reflected by records taken that year mainly during June and July. A large additional reduction, especially in grama and buffalo grass density is appearing in records now being taken, but these 1935 data have not yet been summarized. On certain plots charted in 1935 the reduction in density has been as great as 70 percent.

Volume of forage produced in 1934 was reduced by the drought (40 percent of normal precipitation) to only approximately one-fourth of that for a normal year.

PLANS FOR F.Y. 1935:

Continue livestock weights and vegetation records under way and if possible develop a more satisfactory standard for measuring range forage utilization. The main expansion of work provided for under the increase in regular funds will be the initiation of work with sheep. Plans are being prepared for this phase of the study and the necessary range fences, wells, and other

improvements will be constructed so far as available funds will permit. It is possible that due to limited funds, two years will be required for the completion of the necessary improvements.

ASSIGNMENT: Leon C. Hurtt, L. C. Ellison, and E. J. Woolfolk in cooperation with Montana Agricultural and U.S.R.L. Experiment Stations.

RR-NRM

FINANCIAL PROJECT: Range Investigations.

WORK PROJECT: Artificial Reseeding Investigations.

RESEARCH PROJECT: Artificial Reseeding

SCOPE: To find the most promising methods and forage species, costs considered, for reseeding plowed dry lands or overgrazed ranges, and to determine the place that such artificial reseeding should play in a balanced program of range livestock production and proper land use. Sub-marginal dry farm land mainly in eastern Montana, amounting to between 4 and 5 million acres, that has been plowed and abandoned and is now tax delinquent presents an economic problem as well as an erosion and watershed menace which demands much data that are not now available.

STATUS: Limited reseeding work from regular Forest Service funds was started in old Fort Keogh in the spring of 1932 and continued in 1933 and 1934. A substantial allotment of Nira and ECW funds made possible considerable expansion in 1934 and the spring of 1935. Test and demonstration areas were established on National Forest special used and burned areas; on both virgin and abandoned dry

farm lands at Fort Keogh; in the Forest School nursery at the University of Montana; and, under cooperative agreements, on privately owned plowed and abandoned dry farm lands of eastern and central Montana. The detailed research phases of the study are being carried on at old Fort Keogh and in the Forest School nursery while the demonstration or field test phase is being stressed on the privately owned lands. More than 40 selected ranchers in 22 central and eastern Montana counties have entered into 5-year cooperative agreements and have each seeded from 5 to 40 acres of abandoned land.

Approximately 1,100 acres are included in the experimental and demonstration seeding areas. Four hundred and twenty-five acres were seeded in the fall of 1934 and 430 acres in the spring of 1935. Most of the remaining 225 acres were seeded in the fall of 1933 and spring of 1934 and therefore were subjected, during the period of germination and/or establishment, to the full effect of the most serious drought of record in the region. Precipitation at Miles City during 1934 was only 40 percent of normal.

Twenty species of grass have been used in varying amounts. However, crested wheat grass because of its drought resistant reputation, has been used on about 75 percent of the area.

Although this species is proving the best for the Great Plains conditions, several other species including slender wheat grass, Hungarian brome, meadow fescue, Canadian blue, tall oat, and Harbins lespedeza, offer promise of satisfactory use.

One abandoned field at old Fort Keogh successfully seeded to crested wheat grass is being used in an experiment to determine the range value of this species as compared to that of native gramma and buffalo grass ranges. Two lots of ten uniform yearling steers are being used in this experiment. One lot will be summered on the crested wheat grass field while the other lot will be pastured on an adjoining fenced tract of native range.

RESULTS TO DATE:

In spite of the fact that precipitation (5.51") during 1934 at Miles City was only 40 percent of normal, crested wheat grass established itself reasonably well. More than 32 percent of the area sown in the fall of 1933 and spring of 1934 now show a reasonable degree of success and not all plots have as yet been examined this summer. Actual figures for the areas reseeded in the fall of 1934 and this spring are of course not available but such preliminary observations as have been made indicate success in nearly every case.

Although the present cost of seed, particularly crested wheat grass at 75¢ per pound, is now extremely high, it is probable that with the development of a steady market these prices will be reduced to a reasonable figure. Granting that seed can be purchased at a fair figure, a preliminary conclusion so far is that a very great acreage of plowed and abandoned range land can be reseeded at a cost that will be justified by increased carrying capacity and by reduced wind and water erosion.

PLANS FOR F.Y. 1936:

The reduction in work which has resulted from the cessation of Nira allotments and from reductions in ECW allotments for research will prevent further expansion of this project. Funds available from regular allotments will be used to continue examinations of the cooperative projects on private land and for continuing the detailed studies at old Fort Keogh.

ASSIGNMENT:

Leon C. Hurtt, with the assistance of Lincoln Ellison and H. J. Woolfolk, in cooperation with the Montana and U. S. Range Livestock Experiment Stations and various private land owners.

FINANCIAL PROJECT: Forest Products Investigations.

WORK PROJECT: Production Costs and Utilization Investigations.

RESEARCH PROJECT: Logging and Milling.

SCOPE: This project provides information on two important phases of logging and milling. They are:

1. Selective Logging - which has three objectives:
   a. To determine cost of growing stumpage suitable for sawlogs, ties, mining timber, etc., also production costs and market values for logs, trees, lumber and other forest products produced from each commercial type in the Region. Final results to show from a regional standpoint, or for an individual holding, cutting limits (by tree d.b.h. and area) and utilization standards necessary to provide a reasonable profit for the operator when practicing varying degrees of silviculture.
   b. To make available to lumbermen, foresters, and other interested agencies, information secured incidental to the main project, such as overrun data, efficiency comparisons of various types of logging and mill-

ing equipment, etc.

c. To make available to the same agencies, data fundamentally useful in the promotion of industrial forestry.

2. Logging output studies designed to measure the efficiency and effect upon good forestry practice of new logging equipment and new logging methods as they are introduced.

STATUS: 1. Selective logging studies have been undertaken in the western white pine type, the ponderosa pine type and the larch-Douglas fir type. Studies and their status are listed below by timber types.

Study	Field Work	Office Compilation	Results Made Available
a. Ponderosa pine type.			
Heron Lumber Co.	Complete	Complete	Yes
Harper Lumber Co.	"	"	"
J. Neils Lumber Co.	"	"	"
A.C.M. Relogging	"	"	"
A.C.M. 1932	"	"	"
Deer Park Lbr. Co. Started in cooperation with Code Engineers of the Western Pine Association but abandoned.			
b. Western white pine type.			
Region wide 1925 mill scale	Complete	Complete	Yes
Ohio Match Co.	"	"	"
White Pine Lbr. Co.	Incomplete	Incomplete	No
c. Larch-Douglas fir type.			
Kinshella Tie Mills	Complete	7/8 complete	Partly

2. Logging output studies.

RESULTS OF PAST YEAR:

1. Tractor and arch skidding in ponderosa pine. Field and office work complete and results made available.

2. a. Office compilation and scientific report for the Ohio Match project were completed and the results published in a trade journal article.

b. Office compilation for the Kinshella Tie Mills project was completed and the rough draft of the scientific report prepared.

c. The results of the A.C.M. project were made available in a bulletin published in cooperation with the University of Montana and the State Forester of Montana. A trade journal article, one Applied Forestry Note, and two lantern slide lectures were also prepared and presented for the use of interested agencies.

Information is now available on economic tree and log grades for ponderosa pine, also on the minimum sized profitable tree in (1) the ponderosa pine types (2) the western white pine type and (3) the larch-Douglas fir type for several methods of cutting.

PLANS F.Y. 1936:

1. Complete scientific report and publish results of Kinshella Tie Mills project.

2. Inaugurate and complete all phases of the White

Pine Lumber Company project in the western white pine type.

3. Apply accumulated results of selective logging studies to operation of Anaconda Copper Mining Company and determine possibilities and limitations of sustained forestry practice on their timber lands.

4. Bring logging output data on motor trucks and tractors up to date.

ASSIGNMENT: Anderson and Rapraeger.

RP-NRM

FINANCIAL PROJECT: Forest Products Investigations.

WORK PROJECT: Production costs and Utilization Investigations.

RESEARCH PROJECT: Species Utilization for Western Larch, White Fir, and Lodgepole Pine.

SCOPE:

a. To prepare or assist in preparing bulletins to furnish detailed information on the properties and characteristics of the wood of several of the Region's little-used species (western larch, white fir and lodgepole), which will assist consumers in determining the suitability of the species for specific uses. Generally it is intended to promote the good utilization of such species, thereby increasing the economic value of this source of our present timber supply.

STATUS:

a. Western Larch - Bulletin #285 published 1932.

b. White Fir: Bulletin #408 published February, 1934.

c. Lodgepole Pine:

All available data have been assembled but preparation for publication of bulletin has been deferred pending completion of work on other projects of more urgent nature. Present

economic conditions in the lumber and timber products industries have tended to place the widespread utilization and sale of lodgepole pine further into the future. Thus the need for information on utilization of this species has been minimized.

RESULTS OF PAST YEAR: No work was done.

PLANS F.Y. 1936: No work contemplated, but the project will be carried on the active list.

ASSIGNMENT: Lodgepole Pine Bulletin - Whitney.

FINANCIAL PROJECT: Forest Products Investigations.

WORK PROJECT: Production Costs and Utilization Investigations.

RESEARCH PROJECT: Woods and Mill Utilization.

SCOPE: This project will furnish information from time to time pertaining to utilization in the sawmill and the woods, with special reference to the following:

a. Overrun data and efficiency comparisons of logging and milling equipment.

b. Waste investigations designed to inventory and eliminate wood waste in lumbering.

c. Depreciation studies designed to measure volume and value losses caused by agencies such as fire, fungus stain, insects and physical injury during the process of manufacture.

STATUS: a. The results of overrun and sawmill efficiency studies have been presented to the lumber industry of the Inland Empire.

b. Residual wood after logging has been inventoried in the western white pine, ponderosa pine, larch-Douglas fir and lodgepole pine types. Breakage loss in felling timber in the western white pine, ponderosa pine and

larch-Douglas fir types has been studied and results prepared for circulation to loggers and lumbermen.

c. The results of comprehensive studies of fire damage, depreciation in river-driven white pine logs and depreciation in white pine logs transported over gravity chutes, have been published and distributed to the northwestern lumber industry.

RESULTS OF PAST YEAR:

a. Mimeograph circular released showing comparison of long logs and short log scale.

PLANS F.Y. 1936:

No work planned.

ASSIGNMENT:

Anderson and Kapraeger.

RP-NRM

FINANCIAL PROJECT: Forest Products Investigations.

WORK PROJECT: Statistics of Production, Consumption, and Distribution of Forest Products.

RESEARCH PROJECT: Statistics. (Includes Annual Lumber Census, Price and Lumbering Costs.)

SCOPE: The scope of this project is three-fold:
Activity 1. A canvass of all the sawmills and producers of miscellaneous timber products to obtain the production of lumber, lath, shingles and miscellaneous timber products.
Activity 2. Collection of lumber and timber products price statistics for northern Idaho, eastern Washington and western Montana, in sufficient volume to indicate periodic trends in the selling price of lumber (wholesale and retail) stumpage, logs, cedar products, and ties.
Activity 3. Collection of detailed logging and manufacturing costs from the larger lumber companies in northern Idaho, eastern Washington, and western Montana, by personal contact.

STATUS: Activity 1. This work is handled each year for the states of Idaho and Montana in cooperation with the Bureau of Census. On the average 800 concerns are canvassed, some of which require personal solicitation. It is planned to continue

this cooperative project indefinitely.

Activity 2. Annual wholesale lumber prices are now available dating back to 1912. Retail prices on lumber are available dating back to 1920. Wholesale prices on logs, ties, and cedar products are also available back to 1920. Stumpage prices have been recorded annually since 1912 and are furnished currently to interested agencies.

Activity 3. Detailed lumber production costs are now available back to 1916.

RESULTS OF PAST YEAR:

Collected and compiled statistics on all the activities outlined above last year as in the past.

PLANS F.Y. 1936:

Continuation of all activities in project.

ASSIGNMENT:

Whitney to Activity 1; Rapraeger and Hinton to Activity 2; Anderson and Neff (Regional Logging Engineer) to Activity 3.

RP-NRM

FINANCIAL PROJECT: Forest Products Investigations.

WORK PROJECT: Investigations of Wood Treatments, Coatings, Paints, Glues, and Laminated Construction.

RESEARCH PROJECT: Wood Preservation.

SCOPE: To determine the durability of treated and untreated local woods in actual service and the efficiency of various preservatives, including results of treatments by different processes. This work is done in cooperation with the Forest Products Laboratory.

STATUS: The project now includes about 20 installations distributed widely throughout the region. More than 20,000 test timbers consisting of full sized railway ties, telephone and electrification poles, pole stubs, fence posts and mining timbers are included. Data on several of these installations are obtained from inspections made by Forest Supervisors. In addition to the detailed service records obtained for poles specifically designated as experimental timbers, the Montana Power Company and the C.M.St.P. & P. Railroad Company furnish stubbing and replacement records on approximately 33,000 treated and untreated power line and

electrification poles.

RESULTS OF PAST YEAR:

Inspections of two test tracks, three telephone lines and two experimental fence post installations were made as scheduled for the year. As the small number of arsenic-treated poles and stubs remaining in the Livingston-Main Boulder telephone line in 1933 were removed in the spring of 1934, this test was closed. An examination of creosoted lodgepole pine stubs in the Choteau-Ear Mountain telephone line listed for inspection in 1934 was postponed. One new test initiated in cooperation with the Forest Products Laboratory and the Forest Supervisor at Bozeman, Montana, was started on the Gallatin Forest. In this experiment 377 lodgepole pine fence posts were treated with a 3 percent tetrachlorphenol-petroleum oil solution. Treating was done in accordance with a working plan prepared by Whitney. All labor in connection with treating was furnished from the Basin CCC camp D-F-73. Detailed treating records contained in reports by the Camp Superintendent were summarized and sent to the Forest Products Laboratory. These posts were treated for use in ranger station fences to be constructed in the spring of 1935. Setting records will be furnished by the Forest Supervisor.

Data on the service life and mortality of cedar poles compiled by Whitney from service test records of the Montana Power Company and the C.M.St.P.&P. Railroad Company pole lines were furnished the State of Washington Department of Public Works, Seattle.

PLANS F.Y. 1936: Make inspections and prepare reports on each of the following installations:

Project L-50 - Northern Pacific test track ties, Thompson Falls, Montana.

Project L-214 - Northern Pacific test track ties, Missoula, Montana.

Project L-214 - Choteau-Ear Mountain telephone line, creosoted lodgepole pine stubs, Lewis and Clark Forest, Montana.

Project L-214 - Sunnyside Ranger Station fence, arsenic-treated posts, Deerlodge Forest, Montana.

Project L-214 - Gates of Mountains Transportation Co., arsenic-treated poles, Helena to Hilgers' Landing, Montana.

Project L-214 - Ammen Fence, Missoula, Montana, experimental lodgepole pine and cedar posts.

Project L-214 - Missoula-Monture telephone line, arsenic-treated poles and stubs.

Using records furnished by Forest Supervisor Willey of the Lewis & Clark Forest, in January 1935, prepare final report on the Kings' Hill-Musselshell-Two Dot telephone line in which stubbing of arsenic-treated poles was completed

in 1934. Summarize records received from the Montana Power Company covering an inspection of the Harlowton-Roundup-Billings transmission line in June 1934. Inspect split cottonwood posts treated with mixtures of coal tar and spent crank case oil at J. H. Ray Ranch near Missoula. The Forest Products Laboratory has requested that several hundred of these posts treated in May, 1934, at a total cost of only 3 cents each be selected for study of the life obtained from such treatments.

ASSIGN-MENT: Whitney.

RE-NFM

FINANCIAL PROJECT: Survey of Forest Resources, Present and Future Requirements.

RESEARCH PROJECT: Forest Survey - Inventory Phase. Covering the Inland Empire Region of the Pacific Northwest. The Inland Empire is defined as Montana, west of the Continental Divide; Idaho, north of the Salmon River; and the forested counties in northeastern Washington tributary to Spokane. Three counties, Spokane, Pend Oreille, and Stevens, have been designated as that part of the Inland Empire in northeastern Washington.

SCOPE: The inventory phase of the Survey consists of:

a. Determination of the area of each type of forest cover and the estimated stand by species.

b. Classification of the present stand according to its accessibility for conversion.

c. Forest cover map.

d. Determination of regrowth conditions on cut-over and burned lands.

e. Classification of the forest area according to ownership and use policy.

f. Classification of forest area according to its

forest productivity.

STATUS: There are approximately 25½ million acres of forest land within the above designated region. Fifty-three percent of the above total or 13½ million acres is in the National Forests. Inventories of varying degree of intensiveness have been made of the forest resources within the National Forest. All of the Forests, however, need some checking and additional information to bring them to Survey standards and several require practically a complete job of type mapping in place. Ten and one quarter million acres of forest land have been mapped in place in the field and 2-inch-to-the-mile township type maps in color have been prepared for all acreage mapped. In addition, cruises have been obtained on practically all of the merchantable timber owned by the States and the large private owners. The cruises have been adjusted on ten percent of the total area. Office compilation for the work done to date is 75 percent complete.

RESULTS OF PAST YEAR: Due to the allotment of emergency funds for this work, progress on this phase of the Survey was very satisfactory. During the summer of 1934, an average of thirty man mapped in the field and about the same number were employed

in office compilation from the middle of November (1934 to the end of June 1935). Approximately nine million acres of forest land were mapped in place in the region. The area covered includes the most broken type conditions as well as some of the most valuable timber land in the region. The latter class of land naturally deserves more careful consideration than the rough back country areas included in the National Forests. Maps for all of the area covered last summer have been coordinated, inked, transferred to the permanent 2-inch-to-the-mile township plats, and colored. Work was started on compilation of the 1-inch-to-the-mile unit type maps. These maps are being compiled in units of approximately 40 townships each. Each section will be 30" x 48". Several of the base maps, including all of the type information available to date, have been compiled. Cruises were collected for practically all of the merchantable timber owned by the State and large private owners in western Montana. The cruises for north Idaho and the three eastern Washington counties were previously collected. Compilation of type areas has been done on 75 percent of the area covered. Final type area summarization by owner-

ship classes has been made for Benewah and Spokane counties. All of the preliminary data have been assembled and put into shape for approximately 16,000 M acres which is the area that is planned to be covered during the coming field season if funds and man power are available in time.

PLANS F.Y. 1936:

The present situation is such that it is impossible to make worthy plans. Regular funds are only sufficient for the payment of salaries and expenses of the three permanent members of the Survey organization and an obligated share of the Station's overhead expense. Unless usable emergency funds continue to be made available, an almost complete cessation of activities will be necessitated.

On July 1, 1935, eighteen temporary employees and three detailed Forest officers were employed on the inventory phase of the Survey. All of these men with the exception of one office man were type mapping in place in North Idaho. Funds are now available to keep the present organization in the field until the end of September, 1935. During this period it should be possible to complete the field type mapping for the areas still uncovered in Bonner, Boundary, Shoshone,

Latah and Clearwater counties in Idaho. If usable emergency funds continue to be made available through the next (6th) work period it would be possible with the same organization to complete the type mapping in place in the remainder of the North Idaho unit and do the adjustment cruising in the three northeastern Washington counties. Maps in final form covering all the area mapped during the field season could be compiled during the 6th work period and considerable work done on office compilation if emergency funds were continued. Under present restrictions it does not seem practicable to make use of any ERA funds that might be allotted for field work on type mapping and adjustment cruising.

ASSIGNMENT: M. Bradner, Regional Director, G. M. DeJarnette; T. Rowland (Regional office).

FINANCIAL PROJECT: Survey of Forest Resources, Present and Future Requirements.

RESEARCH PROJECT: Forest Survey - Growth Phase.

Covering the Inland Empire region of the Pacific Northwest.

SCOPE: To determine the growth rates in old stands and on restocking areas and the probable future yields.

STATUS: Though considerable data on growth and yield have been collected for the white pine type in this region by the Forest Management Division of this Station, and in the ponderosa pine and Douglas fir types by the Pacific Northwest Station, practically no work has been done to compile and correlate the results for application to the Forest Survey project. Very little work has been done in this region on growth rates and yields in the larch-Douglas fir, lodgepole pine, cedar, and spruce types. The Forest Survey field mappers have, since the work started, obtained for each area typed the degree of stocking, the age and the site. There has been collected, in addition, considerable information on the percentage of species, size classes, and volume in stands of different types and ages.

RESULTS OF PAST YEAR:

In January, 1935, L. J. Cummings was assigned to the growth phase of the Survey. During the last half of F.Y. 1935 he collected all the available information on growth and yield applicable to this region and analyzed it with a view of its application to the Survey project. He prepared tentative work plans covering the minimum number of studies necessary to provide the Survey with growth rates and yield figures. These plans cover the following studies:

(1) Work plan for yield study of western larch-Douglas fir.

The purpose of the study will be to construct normal yield tables for the western larch-Douglas fir types applicable throughout the range of the type in Region One, the immediate purpose being to apply the tables to Forest Survey growth data.

(2) Working plan for a study of growth characteristics of virgin, mature ponderosa pine in Montana.

The purpose of the study being to determine whether or not there is net increment in virgin, mature ponderosa pine stands.

(3) Working plan for office work preliminary to stocking correlation field study.

The object of this study is to determine the relation of number of trees to average diameter

for normally stocked western white pine stands.

(4) Working plan for office study of relations between average heights of dominant trees and average heights of dominant and codominant trees.

The purpose being to determine the relation between the average height of dominants alone and the average heights of dominant and codominant trees, in order that the proper application of the western white pine yield tables to the Forest Survey can be made.

(5) White pine stocking correlation study.

The purpose of this study is to determine the average stocking percent in terms of basal-area-per-acre of the areas included in each percentage group on the Forest Survey type maps.

(6) Working plan for immature cedar pole increment study in virgin stands.

The purpose of this study is to estimate the average number of years required by small cedar poles and by cedar seedlings and saplings to develop to merchantable pole size.

PLANS F.Y. 1936:

The present situation is such that it is practically impossible to make definite plans for field work. The regular funds are sufficient to pay the salary and expenses of L. J. Cummings (now a regular member of the Survey staff) but

does not include anything for additional field help.

If sufficient usable emergency funds are allotted to keep the present 3-man crew employed during the remainder of the present field season, approximately 60% of the field data on this one study could be collected. Cummings, of course, would continue to work on this phase of the Survey. Original plans called for the assignment of three 3-man crews to start the studies in the ponderosa pine, larch-Douglas fir, and Idaho white pine types.

ASSIGNMENT: L. J. Cummings, M. Bradner.

FINANCIAL PROJECT: Survey of Forest Resources, Present and Future Requirements.

RESEARCH PROJECT: Forest Survey - Depletion Phase.

Covering the Inland Empire region of the Pacific Northwest.

SCOPE: To determine the average annual rate of depletion by cutting, fire, insects, disease, or any other factors.

STATUS: Statistics on the production of forest products within the Region have been collected currently by the Division of Forest Products of this Station for many years. The Region One office of Operation and the several Fire Association offices have likewise kept records for many years on the acreage and volume burned over by fire within the Inland Empire. The Region One office of Forest Management, in cooperation with the Forest Insect Field Station at Coeur d'Alene, have gathered together general information on epidemic insect losses. Prior to last year these data had never been corrected, compiled, and analyzed to furnish accurate figures on the average annual rate of depletion that could be applied to the Forest Survey inventory data.

RESULTS DURING PAST YEAR:

During the past winter and spring production figures were compiled to give accurate figures on the average annual drain by cutting, separately by counties for the Inland Empire region. Additional information was needed on the amounts of fuel wood, farm fence posts, poles and timbers, local mine timbers, and other minor forest products cut annually. Considerable work was done on this survey and it is expected that sufficient information will have been collected by fall to complete the report on drain by cutting.

One man was assigned in April and one in June to assist the Forest Insect Field Station staff in making a check survey of the average annual epidemic loss by insects throughout the region. The crew completed the Survey in the Nezperce forest in June and moved into Clearwater county. Considerable work was done by the field mapping crews last year in arriving at the acreage and volume losses by fires in the several timber types. A check of the available information on fire losses was made and plans formulated for a supplemental fire damage study by field type mappers.

PLANS F.Y. 1936:

A report on the average annual rate of depletion by cutting will be completed during the year. Work on the survey of insect losses is de-

pendent upon the allotment of usable emergency funds. Present funds will keep the 2-man crew in the field through September 1935, on this work. At this date, it would be necessary to enlarge the insect loss survey crew from two to four additional field men to complete the check during the present field season. If additional usable emergency money is not forthcoming this phase of the work will have to be continued in 1936. The insect Field Station is, of course, always adding to the information on insect losses but the data are not available in the form for application to the Forest Survey. Survey field mappers will continue to get information on the acreage and volume losses by fire. It does not appear practicable to use ERA funds, with their present restrictions on this type of work.

ASSIGNMENT: C. N. Whitney, G. B. Hutchison (temporary Junior Forester), M. Bradner.

RE-NRM

FINANCIAL PROJECT: Survey of Forest Resources. Present and Future Requirements.

RESEARCH PROJECT: Forest Survey - Requirements.

SCOPE: To determine the current need for forest products based on present consumption. To determine the trends in the uses of forest products and the underlying causes for such trends. To determine the major opportunities for expansion in outlets for products of our forest lands.

STATUS: Collection of data on volume and type of construction in cities selected as sample plots has been completed. Seven of the principal cities of the region, including Missoula, Butte, Bozeman, Livingston, and Great Falls, Montana; Lewiston, Idaho, and Spokane, Washington, have been covered. In five of these cities detailed card records for each new building or repair permit issued in 1929 were made. At Spokane and Butte data needed to supplement published records were obtained. Building permit records collected in five cities have been tabulated. Thirty-three bills of material for use in determining the relation between cubic volume of different classes of buildings and the lumber required in their

construction have been obtained. In several of the cities sampled summaries showing total volume on construction and number of living units provided annually, 1921-1930, inclusive; vacancy records and timber requirements of city governments were collected. Records showing the consumption of lumber and other forest products used by four county governments in construction by their own forces have been obtained. Data on total mileage of lines and annual timber requirements of some of the principal telephone and electric utilities in Montana and Idaho have been collected. Statistics of lumber and miscellaneous timber products consumed by the copper mining industry in Montana have been compiled, and brought up to date. Conversion factors showing the total quantity of wood used in various forms per ton of ore mined by the Anaconda Copper Mining Company in Montana, have been worked up. Data of value in the analysis of rural timber requirements, obtained from the Federal Civil Works Administration, Farm Housing Survey, early in 1934 have been tabulated and summarized. Records of farm requirements obtained by actual canvass of 62 farms in northern Idaho and by questionnaires mailed to 750 farmers in Montana and Idaho now cover 113 farms in the two States. Detailed records showing the total quantity of

each kind of fuel consumed in 1934 in six of the principal incorporated cities of northern Idaho.

RESULTS OF PAST YEAR:

Through cooperative arrangements with the Montana State College at Bozeman and the University of Idaho, information taken from the daily schedules of the farm home enumerators of the Civil Works Administration, farm housing survey, was obtained for 4804 farms in Montana and 4465 farms in Idaho. Additional data from the "Engineer" schedules showing size of houses, repairs, and additions needed, etc., were obtained for 804 houses in these states. Conversion factors applicable to the quantitative data recorded for buildings covered by the Engineer schedules were worked up and total lumber requirements in repairs and additions computed for each county. Additional computing work on bills of material and building permit records previously obtained for the cities sampled in this region was done. The Anaconda Copper Mining Company's lumber and timber products consumption figures and ore production records for the ten-year period 1923-1932 were compiled. Urban fuel surveys for Missoula and Hamilton, Montana; St. Maries, Potlatch, Moscow, Lewiston, Orofino, and Grangeville, Idaho, were completed. A field canvass

covering the wood requirements of 62 farms in northern Idaho was made. A questionnaire was mailed to 750 farmers in Idaho and Montana. About 50 usable returns have been received to date. From January 1, 1934, to June 30, 1935, total time spent on the requirements phase of the survey amounted to approximately 4 months by Whitney and 2½ months for clerical help paid from CWA and other emergency funds. From January 21, 1935, to June 30, 1935, while assisting with both depletion and requirements, Junior Forester, S. B. Hutchison spent about 2½ months on field and office work pertaining to wood requirements.

PLANS F.Y. 1936

Complete summarization and analysis of urban building construction data and prepare reports. Collect statistics of wood consumed in Coeur d'Alene mines of Idaho, and coal mining districts of Montana to bring existing records up to date. Conduct fuel surveys covering 5 additional cities in northern Idaho and about 15 of the principal cities of Montana. Obtain data from a number of the smaller telephone and electric utilities which have not been covered. Continue study of rural requirements by sampling about 50 additional farms in north Idaho, 40 farms in northeastern Washington,

75 farms in western Montana and 100 farms in eastern Montana. With emergency funds now available to the end of September, the canvass of farms in northern Idaho, northeastern Washington, and western Montana can be completed. If emergency funds continue to be made available for the 6th work period (October 1, 1935, to March 31, 1936) the survey could be completed in eastern Montana.

ASSIGNMENT: M. Bradner, Regional Director; C. N. Whitney and S. B. Hutchison.